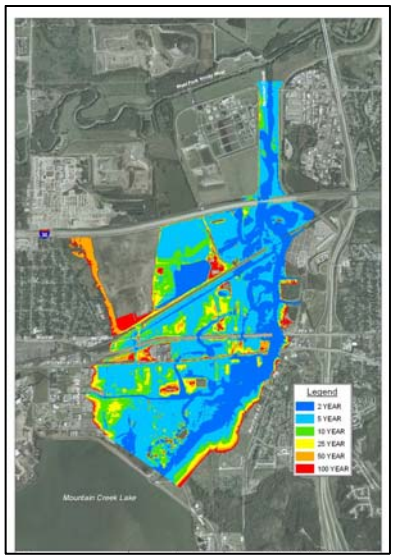
Espey Consultants, Inc.

FINAL

MOUNTAIN CREEK
Flood Protection Plan



City of Grand Prairie

January 16, 2009

Project No. 6028.101

MOUNTAIN CREEK FLOOD PROTECTION PLAN

Prepared for:

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January 16, 2009
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1/16/09

EXECUTIVE SUMMARY

This document is a Flood Protection Plan for the City of Grand Prairie located in Tarrant and Dallas Counties, Texas. In response to concerns over major flooding events and local drainage problems, the City of Grand Prairie and its supporting partners (Trinity River Authority, County of Dallas, City of Dallas and the US Army Corps of Engineers) applied for funding assistance through the Flood Protection Planning Program of the Texas Water Development Board (TWDB). The project contracts were initiated by the TWDB on February 14, 2006.

The purpose of the project was to develop comprehensive hydrologic and hydraulic models for the Mountain Creek watersheds within and upstream of the City of Grand Prairie to be utilized in developing flood protection alternatives (both structural and non-structural). The study does not include areas tributary to Joe Pool Lake, as it was determined that this area was hydrologically disconnected. The study follows the natural course of the watershed, and therefore, evaluates the watershed as a system independent of political boundaries. The detailed hydraulic analysis extends from Mountain Creek Lake dam to the confluence with the West Fork Trinity River.

Major elements of the Mountain Creek Flood Protection Plan include: comprehensive hydrologic and hydraulic analysis, flood mitigation recommendations, and preliminary phasing and implementation considerations for the flood mitigation alternatives.

The Mountain Creek Flood Protection Plan evaluated six (6) alternatives. The proposed alternatives are intended to deal with nuisance flooding from both localized rainfall events and from Mountain Creek. To assist the City in prioritizing which projects should be funded, the alternatives are assessed with a combination of cost of implementation and associated benefits. The six alternatives analyzed are described as follows:

- **Alternative 1**: Central Channel Improvements;
- **Alternative 2**: West Channel Improvements;
- **Alternative 3**: Demolition of Eastbound Jefferson Street overbank roadway and culverts (in conjunction with Alternatives 1 and 2);
- **Alternative 4**: Additional Upstream Detention;
- **Alternative 5**: Improved Secondary Channels (Alternative 3) & Upstream Detention (Alternative 4); and,
- **Alternative 6**: Main Channel Improvements.

The alternatives discussed in this report were found to have limited beneficial impacts to the Mountain Creek floodplain. Many of the proposed improvements only provide localized benefits by decreasing prolonged flooding after storm events. No single alternative presents itself as a clear project to pursue, and consequently the City should evaluate and assess the cost and effectiveness of any selected alternative and prioritize it for funding against other needs of the City.

ACKNOWLEDGEMENTS

Espey Consultants, Inc., has completed the Mountain Creek Flood Protection Plan for establishing the understanding of this watershed, the potential for impacts during flood events, and the viability of improvements to reduce this impact. The resources required to address this effort included not just site specific information gathered during the study but additionally resource materials from prior studies of upstream areas that had material effects on the outcome of the plan. Additionally, the value of the final plan was significantly enhanced with the review of plan elements as they were developed by the City of Grand Prairie management and the Technical Advisory Committee established for review of significant milestones during the study. These added resources and the access to the individuals offering input through the Technical Advisory Committee have served to provide greater confidence in the reliability of the final Mountain Creek Flood Protection Plan findings. Thus, the following staff of Espey Consultants, Inc., associated with the project, appreciates the contributions from each of the resources and recognizes that there are many individuals who will go unnamed in recognizing the key contributors to the success of the project. However, Espey Consultants, Inc., gratefully acknowledges the key contributions made by the individuals listed below for their participative support with the Mountain Creek Flood Protection Plan project.

Espey Consultants, Inc. staff involved on Project

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Thomas Mountz, P.E., D.WRE, CFM, Assistant Project Manager
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Representatives of the City of Grand Prairie, local sponsor for the Project

Ron McCuller, Public Works Director
Romin Khavari, P.E., CFM, City Engineer
Bill Crolley, P.E., Director of Planning and Development
Joe Sherwin, P.E., CFM, Flood Plain Administrator
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Texas Water Development Board, state sponsoring agency for the Project

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Gene Rice, P.E., CFM, USACE
Yogi Patel, P.E., City of Dallas Public Works
John Herndon, P.E., Trinity River Authority
Randy Tipton, P.E., Exelon
Chase Ezell, Exelon

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1.0 INTRODUCTION

The Mountain Creek Flood Protection Plan is an engineering analysis of the flooding risks facing Mountain Creek, and a planning analysis of mitigation of flooding risks. This project was funded by the Texas Water Development Board (TWDB) and the City of Grand Prairie, with participation from the City of Dallas, Dallas County, Tarrant County, Trinity River Authority, and U.S. Army Corps of Engineers – Ft. Worth District. The general project location is found in Figure 1. The following sections of this report describe the methods, data, and assumptions used in the analyses, as well as the results obtained.

The topography of the Mountain Creek watershed, the character of the soils, and nature of rainfall in the area are conducive to rapid runoff and sharp-crested flood hydrographs. Flooding can occur frequently and at almost any time of the year. Major floods are known to have occurred on Mountain Creek in 1922, 1928, 1942, 1969 and 1976. There are no documented damage estimates for these floods prior to 1978. The largest flood of record on Mountain Creek at the Grand Prairie gage at Jefferson Street (upstream drainage area of 298 square miles) occurred on April 19, 1976, with a peak discharge of 38,100 cfs. The largest flood of record since construction of Joe Pool Lake Dam in 1987-1989 was 24,700 cfs in May 1989. In the City of Grand Prairie, there have been 308 damage claims and 76 in Dallas County since 1978, totaling more than $7,300,000[1].

The City of Grand Prairie has identified the areas of Mountain Creek between Mountain Creek Lake Dam and its confluence with the West Fork Trinity River as "The Gateway to Grand Prairie," given its proximity to and views from IH-30. However, redevelopment is inhibited due to its susceptibility to flooding. The Mountain Creek Flood Protection Plan identifies risks associated with flooding, and evaluates a combination of structural and non-structural solutions to mitigate the risk.

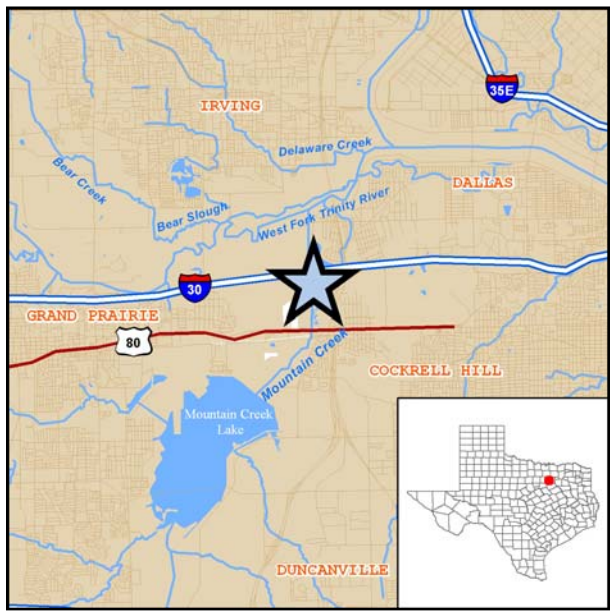

Figure 1: Location Map

1.1 SCOPE OF SERVICES

The primary purpose of this project is to identify flooding issues and possible mitigation alternatives for lower Mountain Creek. The scope of this project includes a hydrologic and hydraulic analysis of the Mountain Creek watershed and review of potential mitigation alternatives. This study includes the collection of baseline information, review of environmental constraints, and the identification of flood/drainage problem areas. Necessary field survey was collected to facilitate the development of a detailed hydraulic model, including survey of structures within the hydraulic study reach and some cross-section/channel survey.

[1] FEMA "Policy & Claim Statistics for Flood Insurance" data, http://www.fema.gov/business/nfip/statistics/pcstat.shtm)

The hydrologic analysis encompasses the drainage areas of Mountain Creek between Joe Pool Lake Dam and the confluence with the West Fork Trinity River. Utilizing and expanding existing hydrologic model data from the FEMA and US Army Corps of Engineers study of Mountain Creek and its tributaries, Joe Pool Reservoir and Mountain Creek Reservoir, an updated hydrologic model of the watersheds was developed using a georeferenced HEC-HMS model. The model includes both existing and ultimate land use assumptions, utilizing existing City of Grand Prairie and County GIS data, and employs SSURGO soil information to generate runoff curve numbers using the NRCS (SCS) method. A modified Puls stream routing was developed for the studied watershed using recent digital topographic data and HEC-RAS. Times of concentration (Tc) and the corresponding lag times were computed using the TR-55 method. Calculated peak discharges were compared to the current FIS flow rates and to observed data from a March 19, 2006 storm. This hydrologic study was modified to exclude the approximately 223 square miles of drainage area tributary to Joe Pool Lake. Joe Pool Lake can (and has been shown to) fully retain floods up to and including a 100-year event, so the lower Mountain Creek study area was determined to be hydrologically independent of flows into Joe Pool Lake. The analysis includes an evaluation of the existing and ultimate conditions 50%, 20%, 10%, 4%, 2%, and 1% (2-, 5-, 10-, 25-, 50-, and 100-year, respectively) annual chance storm events.

Using the collected field survey data, information from design plans, and recent (2001) topographic data, the detailed hydraulic model was created using HEC-GeoRAS. The resulting HEC-RAS model is geo-referenced for correlation with the City of Grand Prairie GIS data. Flood profiles and floodplain maps for the 50%, 20%, 10%, 4%, 2%, and 1% (2-, 5-, 10-, 25-, 50-, and 100-year, respectively) frequency storm events were developed for existing conditions. The 1% ultimate event was also mapped. The hydraulic model also included a floodway run for existing conditions. The existing floodway limits were input into the revised existing conditions model to evaluate the resulting surcharge. Differences in channel and structure geometry from the effective FEMA model resulted in the effective floodway limits producing a surcharge well in excess of one foot in the revised model. Additional study to determine a more accurate floodway limit is required.

The hydraulic analysis of Mountain Creek includes 22,350 linear feet of channel between Mountain Creek Lake Dam and the confluence with West Fork Trinity River. The hydraulic analysis of Thompson's Branch, a tributary to Mountain Creek, includes 4,940 linear feet of channel between Idlewild Street and the confluence with Mountain Creek. Table 1 lists the streams studied as part of the analysis.

Table 1: Studied Streams

Stream Name	Reach Limits	Number of Hydraulic Reaches	Reach Length (ft)	Number of Structures
Mountain Creek	Mountain Creek Dam to Confluence with West Fork of Trinity	1	22,350	6
Thompson's Branch	Idlewild Street to Confluence with Mountain Creek	1	4,940	0

There are three flooding sources in the project area, these are; 1) local flooding, 2) Mountain Creek, and 3) the West Fork Trinity River. Local flooding refers to water falling directly on the area considered or flowing to it on a minor tributary or stream. Mountain Creek flooding refers to water within the main channel and overbanks of Mountain Creek. The West Fork Trinity River can also flood property along Mountain Creek even in the absence of significant flows on Mountain Creek itself. This report will focus on flooding from Mountain Creek. The details of the Thompson's Branch study are included in a separate report included as Appendix K; "*Thompson's Branch Conceptual Analysis*", Espey Consultants, July 2007. The alternative analysis presented in this report only addressed local flooding on Thompson's Branch.

This planning effort identifies and quantifies the nature of the flooding risk, and makes this information available to the public. This effort also identifies possible capital improvements (dependant upon approval of funds) that could potentially mitigate the risk, or a portion thereof, and prioritizes the recommendations in relation to public safety and welfare. The planning effort considers the hydrologic characteristics and hydraulic performance of the watershed in terms of both the existing and ultimate watershed condition.

An analysis of the effects of several structural and non-structural alternatives and resulting level of flood protection was performed. Structural flood protection measures include: channelization, bridge and culvert upgrades, dual-purpose flood control / water supply reservoirs, and detention facilities. Non-structural flood protection measures include: revisions to current drainage policies, purchases of flood prone property, creation of a creek maintenance program, and a flood early warning system in cooperation with related technical partners.

The benefit of each alternative in terms of level of protection/reduction of flood damages, impacts, right-of-way requirements, environmental impacts, etc. were made in comparison to the associated cost of each improvement. The benefits of the specific alternatives analyzed were difficult to quantify as most benefits were to local flooding and very little impact in the 100-year floodplain was seen. This is further discussed in Chapter 4.

The implementation discussion identifies potential funding sources for proposed improvements. The City of Grand Prairie's current Capital Improvements Plan and the Comprehensive Plan were considered such that the recommended flood protection strategies are coordinated and consistent with the broad objectives of the City.

The study is not a FEMA restudy (i.e., the FEMA floodplains will remain unchanged as a result of this study); however, the analyses from this study may be used in a subsequent project to revise the FEMA floodplains and creek profiles if so desired.

1.2 ADVISORY COMMITTEE

This project commenced with a public meeting in the City of Grand Prairie on July 31, 2006. The notice and attendance sheet are included in Appendix J. An advisory committee meeting was held on October 11, 2007 to present the results of the study in the offices of the City of Grand Prairie. The following organizations were represented at this meeting:

1) The City of Grand Prairie,
2) Espey Consultants,
3) Halff Associates,

4) US Army Corps of Engineers,
5) Texas Water Development Board
6) Exelon, and
7) North Central Texas Council of Governments.

The detailed analysis was presented and discussed at this meeting. The contents of this report represent the completed technical analysis and intend to incorporate the desires of the Technical Committee to the maximum extents practicable. A representative from the City of Dallas or the Trinity River Authority were not present at the meeting but are important members of the project team and have been involved in previous meetings. The final public meeting was held on November 9, 2007. Additional information regarding these meetings is included as Appendix J.

1.3 LOCATION AND DESCRIPTION OF WATERSHED

The geographical planning area is the Mountain Creek watershed downstream of Joe Pool Lake, which is composed of two sub-watersheds separated by Mountain Creek Lake. The upper sub-watershed drains approximately 70 square miles, between Joe Pool Lake Dam and Mountain Creek Lake, which includes a large portion of the City of Grand Prairie. The lower sub-watershed drains approximately 10 square miles between Mountain Creek Lake Dam and the confluence with the West Fork Trinity River, across portions of the City of Grand Prairie, the City of Dallas, and Dallas County. The changes in land uses over the past twenty years since the FEMA study require a current evaluation of the risk posed by flooding on Mountain Creek and its tributaries. The watershed location can be seen in Exhibit 1 of Appendix A.

1.4 BASELINE DATA ACQUISITION

The primary data sources for the creation of hydrologic and hydraulic models included:

<u>Aerial Imagery</u>
The aerial imagery used with the analysis was public domain data obtained from the Texas Natural Resources Information System (TNRIS). The aerial images used in the modeling effort are not included in Appendix L – Digital Data; however, they are readily available for download from TNRIS. The imagery was acquired during the 2004 agricultural growing season by the National Agriculture Imagery Program (NAIP). The pixel resolution is one pixel equals one meter, and the data is horizontally referenced to the North American Datum of 1983 (NAD 83), UTM meters, Zone 14N coordinate system.

<u>Field Survey</u>
The field survey of channel cross sections, bridges, and culverts was performed between September 2006 and March 2007 by Marshall Lancaster & Associates, Inc. The field survey data is horizontally referenced to the NAD 83, Texas State Plane, North Central Zone coordinate system, and is vertically referenced to North American Vertical Datum of 1988 (NAVD 88).

<u>LIDAR and Topographic Mapping</u>
The contour data used for this project was based on ground survey and airborne LIDAR data performed in between November 2000 and January 2001 for the North Central Texas Council of

Governments (NCTCOG). The raw LIDAR data was processed into contour intervals of two-feet and delivered to the City of Grand Prairie. The data is horizontally referenced to the NAD 83, Texas State Plane feet, North Central Zone coordinate system, and is vertically referenced to NAVD 88.

Review of Existing Studies and Reports

All available hydrologic and hydraulic studies and reports within the study area were reviewed as a part of this effort. These reports were provided by the City of Grand Prairie, Halff Associates, Freese and Nichols, FEMA, Exelon, and others.

2.0 HYDROLOGIC ANALYSIS

The scope of this project includes a hydrologic study of the Mountain Creek watershed totaling approximately 80 square miles contained within the Cities of Grand Prairie, Dallas and Arlington. The hydrologic analysis includes the evaluation of the existing and ultimate conditions 50%, 20%, 10%, 2%, 4%, and 1% (2-, 5-, 10-, 25-, 50- and 100-year, respectively) annual chance storm events. Version 3.1.0 of the HEC-HMS computer program developed by the Hydrologic Engineering Center of the U. S. Army Corps of Engineers (USACE) is used in the hydrologic analysis to estimate peak flow rates and storm hydrographs for each reach. This section of the report describes the input parameters used in this analysis, the calibration efforts, the correlation with frequency analyses, and the computed peak flow rates used in the floodplain delineation.

Mountain Creek Lake Dam is a privately owned and operated facility by the Exelon Corporation used as a cooling pond for a power generation plant located on the lake. Exelon operates the lake as a level pool facility (to the extent practicable) at elevation 457.5 ft. There is an approximate 1.5 foot maximum range in water surface elevations where the Exelon facilities can operate; this is between 456.0 and 457.5 ft.

Joe Pool Lake is located approximately five miles upstream of Mountain Creek Lake on Mountain Creek. Joe Pool Lake is operated by the US Army Corps of Engineers as a flood control reservoir and it also serves as water supply for the City of Midlothian. The mandatory discharge from Joe Pool Lake to Mountain Creek is 4 cfs and the flood control capacity of the lake can fully retain the 100-year flood event. For these reasons, Joe Pool Lake and its tributary drainage area was assumed to be hydrologically disconnected from the lower Mountain Creek.

2.1 DRAINAGE AREA DELINEATION

The watersheds were manually delineated using numerous sources including: United States Geological Survey (USGS) topographical survey data, NCTCOG LIDAR data, site or highway record drawings, storm drain design drawings, and previous drainage studies. The watershed was further divided into sub-areas at points of critical interest (i.e., confluence of large tributaries, floodwater retarding dams, etc.). Watersheds upstream of Mountain Creek Lake Dam contain large sub-areas. The portions of the watersheds located downstream of Mountain Creek Lake Dam are further subdivided to aid in the analyses within the study reach of lower Mountain Creek. A drainage area map showing the watershed delineation and sub-area names is included as Exhibit 1 of Appendix A.

2.2 PRECIPITATION

The precipitation values used in the hydrologic analysis were taken from the *City of Grand Prairie Drainage Design Manual (October, 2006)* and are shown in Table 2.

Table 2: City of Grand Prairie Depth–Duration Rainfall Data

TABLE 5.4C - Depth-Duration Data

Return Period (years)	Point Rainfall Depths (inches)							
	5-min	15-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
1	0.39	0.76	1.49	1.81	1.99	2.41	2.80	3.21
2	0.49	1.04	1.85	2.22	2.45	2.91	3.45	3.95
5	0.57	1.22	2.45	3.00	3.30	3.90	4.70	5.40
10	0.63	1.36	2.86	3.55	3.85	4.65	5.50	6.40
25	0.73	1.56	3.35	4.15	4.55	5.45	6.50	7.50
50	0.80	1.71	3.82	4.65	5.15	6.20	7.35	8.52
100	0.87	1.87	4.25	5.20	5.70	6.92	8.40	9.55
500	1.00	2.20	5.40	6.60	7.40	8.80	10.50	12.00

2.3 INFILTRATION LOSSES

The U.S. Department of Agriculture Natural Resource Conservation Service (NRCS), formerly the Soil Conservation Service (SCS), has developed a rainfall-runoff index called the runoff curve number (CN) which takes into account such factors as soil characteristics, land use/land condition, and antecedent soil moisture to derive a generalized rainfall-runoff relationship for a given area. A description of these components and the equations for calculating runoff depth from rainfall are provided below.

The NRCS classifies soils into four hydrologic soil groups: A, B, C, and D which indicate the runoff potential of a soil, ranging from a low runoff potential (group A) to a high runoff potential (group D). Digital soil data is available from the Texas Natural Resource Information System (TNRIS) post-processed from the US Department of Agriculture Soil Survey Geographic (SSURGO) database into the Texas statewide mapping system. Exhibit 2 in Appendix A shows the soils map for the study area.

The NRCS provides runoff curve numbers for three Antecedent Moisture Conditions (AMC): I, II and III. AMC I represents dry soil conditions and AMC III represents saturated soil conditions. AMC II is normally considered to be the average soil condition; however, studies have indicated that the average condition ranges from AMC I in west Texas to between AMC II and III for east Texas. Runoff curve numbers vary from 0 to 100, with the smaller values representing soils with lower runoff potential and the larger values representing soils with higher runoff potential. This study assumes an AMC II to represent average conditions.

Curve numbers were evaluated independently of impervious cover (i.e., these curve numbers reflect fair condition open spaces) for this analysis. A composite CN is computed based on area weighting of each hydrologic soil group within each sub-area. Impervious cover values are entered separately from CN values into the HEC-HMS model. The assumed CN values are shown in Table 3. A table describing the weighted CN values for each sub-area is included in Appendix B. HEC-HMS computes 100 percent runoff from impervious areas, while runoff from pervious areas is computed using the selected CN value and the following equations:

$$Q = (P - 0.2 \times S)^2 / (P + 0.8 \times S) \qquad \text{Equation 1}$$

And

$$CN = 1000 / (10 + S) \qquad \text{Equation 2}$$

Where:

Q = depth of runoff (in),
P = depth of precipitation (in),
S = potential maximum retention after runoff begins (in), and
CN = runoff curve number.

Table 3: NRCS Curve Number Assumption

Group	AMC I	AMC II	AMC III
A	21	39	59
B	41	61	78
C	55	74	88
D	63	80	91

Key Assumption: Undeveloped grassland or range land.
Reference: National Engineering Handbook 4 (NEH-4)

The range of calculated existing conditions weighted CN values used in this analysis is 69.3 to 80.0. A summary of CN values for all sub-basins is included in Appendix B.

An existing conditions land use map (North Central Texas Council of Governments, 2000) is analyzed in conjunction with 2004 color-infrared imagery in GIS to estimate existing conditions impervious cover percentages. The hydrologic model for existing conditions utilizes percent impervious cover values calculated for each watershed sub-basin. The Existing Land Use Map is included as Exhibit 3 in Appendix A. The details of this analysis are included in Appendix C. The range of calculated impervious cover percentages for this analysis is 13% to 66%.

The ultimate development conditions (fully-developed conditions) analysis includes modifications to the impervious cover percentages to represent full development. For the purposes of this analysis, full development is equivalent to the estimated level by the year 2030 for Cities of Dallas and Grand Prairie, and 2025 for City of Arlington (as per their respective future land use studies). The Ultimate Land Use Map is included as Exhibit 4 in Appendix A

The impervious cover for each sub-area is modified to reflect the projected land use based on the datasets provided by City of Grand Prairie, City of Dallas and City of Arlington. Land use impervious cover percentages are taken from *City of Grand Prairie Drainage Design Manual* (Oct. 2006). For land use types that are not mentioned in the manual, values are estimated based on previous studies and engineering judgment. The future land use maps provided by City of Grand Prairie and others have more land use types than those for existing conditions. Table 4 below shows future land use types designated in the future land use studies and the modifications employed to maintain consistency. The weighted impervious cover value for each sub-area is included in Appendix C.

Table 4: Future Land Use Impervious Cover Assumptions

Land Use Types in Future Land Use Map	Equivalent to Existing Land Use	IC % Equivalent to Existing Conditions
Airport Industrial	Airports	40%
Campus District	Institutional	40%
Community Activity Center	Institutional	40%
Connecting Corridors	Transportation	35%
Drainage	Flood Control	0%
Floodplain	Flood Control	0%
Heavy Industrial	Industrial	90%
High Density Residential	Multi-family	70%
Light Industrial	Industrial	90%
Low Density Residential	Single Family	25%
Medium Density Residential	Single Family	25%
Mixed Residential - 2	Multi-family	70%
Mixed Residential - 3	Multi-family	70%
Mixed Use	Retail	95%
Parks and Recreation	Parks	6%
Parks Outside Grand Prairie	Parks	6%
Regional Activity Center	Institutional	40%
Regional Industrial Center	Industrial	90%
Residential Neighborhood	Single Family	25%
Roadway	Transportation	35%
Urban Neighborhood	Multi-family	70%

2.4 UNIT HYDROGRAPH METHOD

2.4.1 Background

A rainfall-runoff transformation is required to convert excess rainfall (total rainfall minus infiltration losses) into runoff from a particular sub-basin. The NRCS unit hydrograph option in HEC-HMS is used in this analysis to generate runoff hydrographs for each defined sub-basin within the studied watersheds. The unit hydrograph method represents a hydrograph for one unit (one inch) of direct runoff, which is standard engineering practice.

The dimensionless unit hydrograph developed by the NRCS (see Figure 2) was developed by Victor Mockus and presented in *National Engineering Handbook, Section 4, Hydrology*. The dimensionless unit hydrograph has its ordinate values expressed in a dimensionless ratio, of discharge relative to peak discharge, q/qp, and its abscissa values as time relative to time to peak, t/Tp. This unit hydrograph has a point of inflection approximately 1.7 times the time to peak (Tp), and the time-to-peak 0.2 of the time-of-base (Tb) (NRCS 1985).

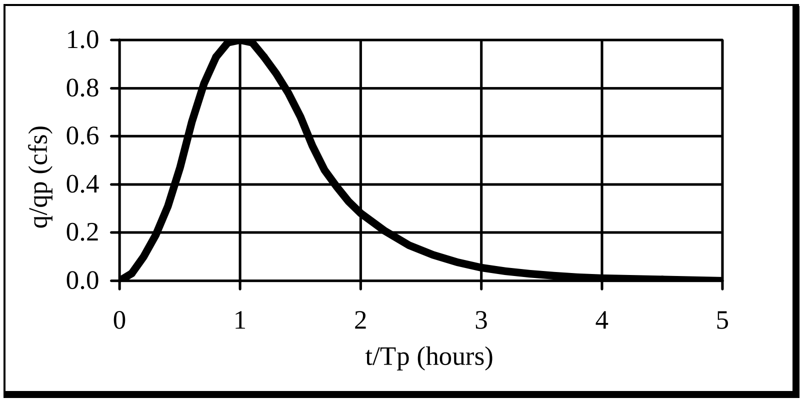

Figure 2: NRCS Unit Graph

In HEC-HMS, input data for this method consists of a single input parameter, T_{LAG}, which is equal to the time (hours) between the center of mass of rainfall excess and the peak of the unit hydrograph (NRCS 1985). In other words, there is a delay in time after a rain event before the runoff reaches it maximum peak. This delay is known as lag. The lag is determined based on the time of concentration, as discussed in Section 2.4.2.

The time to peak is computed using the following equation:

$$T_{PEAK} = \Delta t/2 + T_{LAG} \qquad \text{Equation 3}$$

Where:

T_{PEAK}	=	time to peak of the unit graph (hours),
Δt	=	computation interval or duration of unit excess (hours), and
T_{LAG}	=	watershed lag (hours).

The peak flow rate of the unit graph is computed using the following equation:

$$qp = 484A/T_{PEAK} \qquad \text{Equation 4}$$

Where:

qp	=	peak flow rate of the unit graph (cubic feet per second [cfs] / inch) and
A	=	watershed area (square miles).
484	=	peak rate factor (dimensionless)

Note: The peak rate factor of 484 has been known to vary from 600 in steep terrain to 300 in very flat, swampy terrain. The 484 value is standard engineering practice and is used in this analysis.

2.4.2 Time of Concentration

The methods described in the NRCS method assume that the lag time of a watershed is 60 percent of the watershed's time of concentration. The time of concentration (Tc) is the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed (NRCS, 1985). The time of concentration may be estimated by calculating and summing the travel time for each sub-reach defined by the flow type: sheet flow, shallow concentrated flow, and channelized flow (including roadways, storm sewers, and channels). The methods prescribed in NRCS Technical Release 55 (TR-55) are used to determine the times of concentration for each flow segment in this analysis. Adjustments are made to the time of concentration calculations in the ultimate conditions analysis to reflect faster watershed response times, specifically in the uplands of the watershed. Time of concentration calculations can be found in Appendix D, utilizing each typical flow segment presented below.

2.4.2.1 Sheet Flow (≤ 300 feet)

Sheet flow is flow over plane surfaces. It usually occurs in the headwater of streams. With sheet flow, the friction value (Manning's n) is an effective roughness coefficient that includes the effect of raindrop impact, of drag over the plane surface and obstacles such as litter, crop ridges, and rocks, and of erosion and transportation of sediment. These n values are for very shallow flow depths of approximately 0.1 feet. A maximum sheet flow length of 300 feet is assumed for undeveloped conditions, and 150 feet is assumed for developed conditions. The *City of Grand Prairie Drainage Design Manual (October 2006)* allows for a maximum sheet flow length of 50 feet in developed areas. The Tc calculations were initially performed using this more stringent (shorter) maximum length prescribed in the *City of Grand Prairie Drainage Design Manual*, but were lengthened during model validation to conform with TR-55. This is further discussed in Section 2.6. Travel time is computed as follows:

$$Tt = (0.007 \times (n \times L)^{0.8}) / (P_2^{0.5} \times s^{0.4}) \qquad \text{Equation 5}$$

Where:

Tt	=	travel time (hr),
n	=	Manning's roughness coefficient,
L	=	flow length (ft),
P_2	=	2-year, 24-hour rainfall (in), and
s	=	slope of hydraulic grade line (land slope, ft/ft).

2.4.2.2 Shallow Concentrated Flow

After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow. The average velocity for this flow can be determined from the following figure in which average velocity is a function of watercourse slope and type of channel (TR-55). The flow is still considered shallow in depth and flows in a swale or gutter instead of a channel, which would have greater depth.

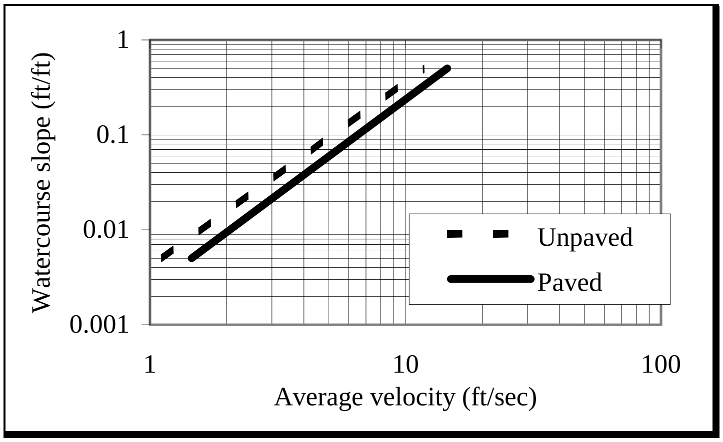

Figure 3: Avg. Velocities for Estimating Travel Time in Shallow Concentrated Flow Segments

After determining the average velocity, the following equation is used to compute travel time:

$$Tt = L / (3600 \times V) \qquad \text{Equation 6}$$

Where:

Tt	=	travel time (hr),
L	=	flow length (ft),
V	=	average velocity (ft/sec), and
3,600	=	conversion factor from seconds to hours.

2.4.2.3 Channelized Flow

As the depth of concentrated flow increases, the shallow concentrated flow evolves into channelized flow. Open channels are assumed to begin where surveyed cross section information has been obtained, where channels are visible on aerial photographs, or where blue lines (indicating streams) appear on United States Geological Survey (USGS) quadrangle maps. In the case of this analysis, channel flow either involves flow in man-made storm sewer infrastructure or flow in the natural channel. Manning's equation or water surface profile information (available from HEC-2 or HEC-RAS) can be used to estimate average flow velocity. Average flow velocity is usually determined for bank-full elevations. Both open channel and closed conduit systems can be included.

Manning's equation is:

$$V = 1.49 \times r^{2/3} \times s^{0.5} / n \qquad \text{Equation 7}$$

Where:

V	=	average velocity (ft/sec),
r	=	hydraulic radius (ft), equal to flow area divided by wetted perimeter,
s	=	slope of the hydraulic grade line (channel slope, ft/ft), and
n	=	Manning's roughness coefficient.

2.5 HYDROGRAPH ROUTING

2.5.1 Stream Flow Routing

Stream routing reaches are modeled using modified Puls data derived from HEC-RAS models developed as part of this study. The HEC-RAS models upstream of Mountain Creek Lake are approximate, without structures or survey data. Results were compared with and found similar to those of the Freese and Nichols detailed studies in this area. The approximate studies were used because detailed studies could not be obtained for all routing reaches. The HEC-RAS model for Mountain Creek downstream of Mountain Creek Lake has been developed in greater detail than the upper watershed using detailed survey information of the creek and hydraulic structures. The HEC-RAS models for the upper Mountain Creek area streams are based on contours (NCTCOG, 2001).

2.5.2 Reservoir Routing

Reservoir routing for Mountain Creek Lake uses the modified Puls method. The 1995 HEC-1 hydrologic model of West Fork Trinity River shows that Mountain Creek Lake was modeled as a reservoir with a pool fluctuation exceeding ten feet. According to Exelon, the dam is operated to maintain a constant pool elevation, to the maximum extent practicable. Since it is not possible to maintain a fully constant lake level, it is expected that some increase on lake elevation would occur during a flood event. Based upon operation data from Exelon, it was assumed that an appropriate assumption is an increase in lake level by one foot during the 100-year storm event. All other events would incorporate percentage of this volume determined by relative flow rates.

However, increases in lake elevation have been recorded and documented (see "Watch Engineer Spillway Gate Operation Record", Appendix G) during flooding events since it is not possible to maintain a fully constant lake level. Therefore, this analysis assumes a variation of one foot during the 100-year storm event and calculated a volume based on this assumption. The data sheet shows a lake elevation rise in excess of one foot, and this event was much smaller than the 100-year event. Other supporting documents provided by Exelon such as Dam Spillway Operating Procedures and Rating Table for flow estimation are also presented in Appendix G.

2.6 HYDROLOGIC MODEL VALIDATION

The March 19, 2006 storm event was used for the validation. The sources of historical data include Mountain Creek Lake Dam discharges recorded by Exelon, the USGS streamflow gage data on Mountain Creek at Jefferson Street and gage-adjusted radar-rainfall data. The USGS states that records for the March 19, 2006 event are of poor quality for the Mountain Creek streamflow gage due to backwater effects from the West Fork Trinity River; therefore, this data is not used for the validation exercise. The estimate peak discharge at Mountain Creek Lake Dam reported by Exelon was 26,450 cfs.

Gage-adjusted radar-rainfall estimates were provided by Vieux, Inc. for the March 19, 2006 flood event. Each of the pixels in the dataset provided by Vieux, Inc. serves as a "rainfall gage" that were area weighted and applied to the appropriate sub-area within the hydrologic model. The spatial dataset of precipitation depths can be found in Appendix L and the precipitation analysis report submitted by Vieux, Inc. can be found in Appendix H.

The Exelon Gate Operation Record includes time and duration of gate opening and calculated discharge rate based on their rating curve. The outlet gate rating curve provided by Exelon was evaluated as a part of this study. The rating curve calculations utilize orifice equations for each quarter foot of gate opening. The calculations assume a tailwater elevation less than 431.0 feet, and all events studied exceeded this elevation. The impacts of tailwater to the flows through Mountain creek Lake Dam were not evaluated as a part of this study.

The validation exercise uses one point of validation, the computed versus observed flows at Mountain Creek Lake Dam for the March 19, 2006 storm event. The primary result of the validation was to show the need for some assumed storage within Mountain Creek Lake, as described above in Section 2.5.2.

2.6.1 Comparison to Exelon Log

The March 19, 2006 storm event simulation in HEC-HMS at Mountain Creek Lake Dam is within 4% of the reported discharge. The computed discharge was 27,550 cfs and the Exelon reported discharge to be 26,450 cfs.

The observed verses computed hydrograph comparison is shown in Figure 5. Please note that the observed data available is not the time series of flow through the dam, but simply the operation log showing the number of gates open, time of opening, amount each gate is open and the associated flow rate. Also, the comparison was only carried out through 10:00 PM on March 19, 2006. For the period of record shown in Figure 5, the general shapes of the hydrographs are very similar (with the Exelon log showing a slight delay representing the response time of the dam operator). For this period of record the computed volume of the two hydrographs is within 1%.

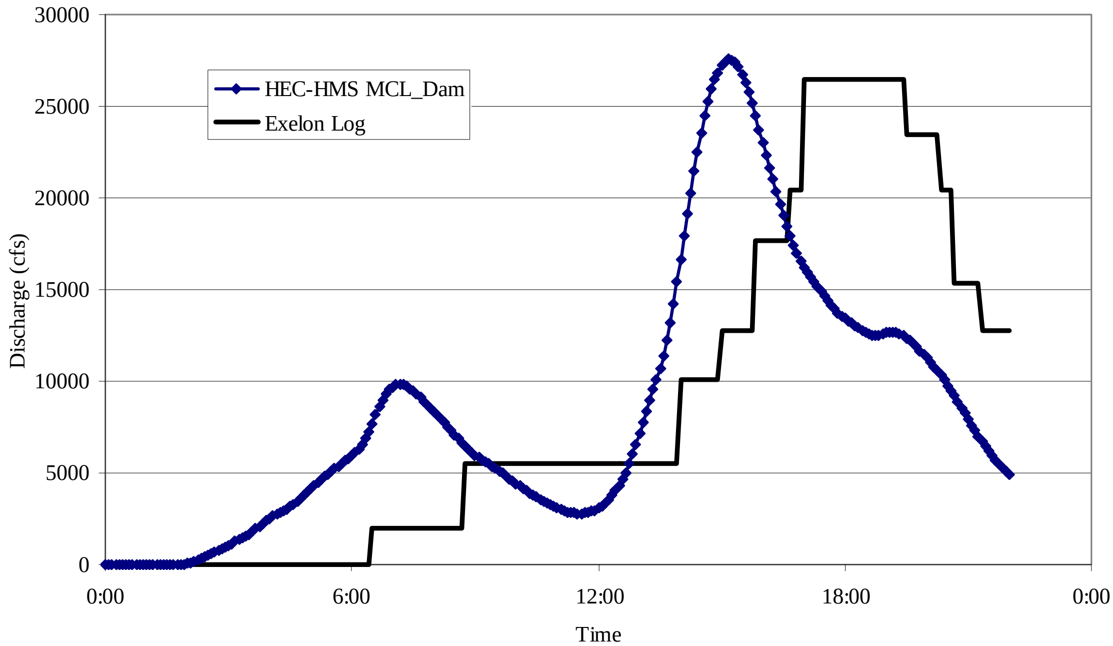

Figure 4: Observed vs. Computed Hydrograph Comparison: March 19, 2006

2.6.2 Comparison to Effective FIS

The analysis of the 100-year design storm shows an increase of less than 1% in the computed 100-Year discharge (59,710 cfs) at the dam from the effective FIS (59,300 cfs). Less attenuation in peak flows is observed between the new computed peak discharges downstream to the West Fork Trinity River. The effective FIS includes an estimated peak of 42,500 cfs while the computed results are 48,820 cfs (15% higher). For the 50-year event, results show an increase from 51,000 cfs to 51,370 cfs (1%) at the dam and from 36,300 cfs to 41,810 cfs (15%) at the West Fork Trinity River. For the 10-year event, results show an increase from 33,500 cfs reported in the FIS to 34,320 cfs (2%) computed at the dam and from 23,200 cfs to 28,240 cfs (22%) at the West Fork Trinity River. The results of the comparison are presented in the Table 5 below.

Table 5: Effective FIS Comparison

A. HEC-HMS Summary Table

HEC-HMS Node	Drainage Area (sq mi)	10-Year Q (cfs)	50-Year Q (cfs)	100-Year Q (cfs)
West Fork	80.2	28,240	41,810	48,820
IH-30	79.6	28,290	41,830	48,810
Golf Course	78.1	31,660	47,430	55,420
TB Junction	75.2	32,150	50,560	58,060
MCL Dam	70.9	34,320	51,370	59,710

B. FIS Summary Table

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
MOUNTAIN CREEK					
At confluence with West Fork Trinity River	79.5	23,200	36,300	42,500	55,300
Below confluence with Stream 8C1	76.4	26,800	41,500	48,400	63,000
At Grand Prairie gage	74.5	26,800	41,300	48,100	62,600
Below confluence with Stream 8C3	72.6	33,500	51,000	59,300	77,100

The primary difference in results computed between this study and the effective FIS is the attenuation of peaks shown downstream of Mountain Creek Lake. Great care has been taken to account for all the available storage within this reach in the current model. The FIS shows a 28% decrease in peak discharges between Mountain Creek Lake Dam and confluence with the West Fork Trinity River while the current model only shows a reduction of 18%. The reductions shown in the FIS appear difficult to justify considering the available storage in this reach of river approximately 1.5 miles long.

2.6.3 Effects of Urbanization

The effective FIS reflects development conditions in the mid 1980's. Increased development within the drainage area since that time would be expected to result in increases in peak flow rates. In order to estimate the sensitivity of the model to development, a simulation was made assuming a reduction of impervious cover by 50% from today's conditions.

The results from this study presented below in Table 6 indicate that a reduction by 50% in impervious cover for the entire watershed resulted in a change in peak flow rate of only 5% to 6% along Mountain Creek downstream of Mountain Creek Lake Dam.

Table 6: Effects of Urbanization Comparison (100-Year Storm)

HEC-HMS Node	Existing (cfs)	Impervious Cover Reduced 50% (cfs)	Percent Impact
West Fork	48,820	45,440	6.9%
IH-30	48,810	45,380	7.0%
Golf Course	55,420	53,000	4.4%
TB Junction	58,060	54,260	6.5%
MCL Dam	59,710	56,120	6.0%

The hydrologic model, therefore, is not very sensitive to changes in impervious cover. A significant reduction in impervious cover assumptions resulted in only a minor change in calculated peak discharges.

2.7 DESIGN STORM ANALYSIS

The application of a design storm in the HEC-HMS model is used to generate runoff hydrographs and estimate peak flow rates along the watercourse for various storm frequencies. There are three major components to the design storm: depth, duration, and distribution. Precipitation depths that have been selected for this impact study are included in Section 2.2. The following subsections describe the analysis and selection of storm duration and distribution.

2.7.1 Design Storm Duration

Design storm duration is a significant consideration for hydrologic modeling. A check must be performed to ensure that the peak flow of any given event has reached the mouth of the studied basin prior to the end of the rainfall duration. The time of concentration for all watersheds is less than 24 hours; therefore a 24-hour duration was selected.

2.7.2 Design Storm Distribution

A balanced and nested distribution is assumed for this analysis due to its flexibility with regard to storm duration. The distribution is balanced in that the precipitation is centered at half the storm duration. The distribution is nested in that the precipitation depths from the *City of Grand Prairie Drainage Design Manual (October, 2006)* are applied in an alternating block format (i.e., the 15-minute depth is applied as the hyetograph peak, the 30-minute depth is applied such that the peak 15-minute block and the adjacent 15-minute block sum to be the 30-minute depth).

2.8 HYDROLOGIC ANALYSIS SUMMARY AND CONCLUSIONS

The hydrologic analysis was completed using prescribed methods by City of Grand Prairie and the NRCS, and validation and sensitivity analysis of the model were performed. The design storm distribution used was the nested and balanced distribution, with rainfall depths derived from the *City of Grand Prairie Drainage Design Manual (October, 2006)*. A 24-hour storm duration was assumed for all the watersheds. The ultimate conditions model was generated by revising the existing conditions hydrologic model to reflect future impervious cover projections. Table 7 lists the computed peak flow rates for existing and ultimate conditions.

Table 7: Computed Peak Flow Rates Summary

HEC-HMS Node	Drainage Area (sq mi)	Existing 100-Year Q (cfs)	Ultimate 100-Year Q (cfs)
West Fork	80.2	48,820	50,090
IH-30	79.6	48,810	50,070
Golf Course	78.1	55,420	56,810
TB Junction	75.2	13,560	13,720
MCL Dam	70.9	59,710	61,320

3.0 HYDRAULIC ANALYSIS

The detailed hydraulic analysis was performed for lower Mountain Creek, from Mountain Creek Lake Dam to the confluence with the West Fork Trinity River. The details of the Thompson's Branch study are included in a report included as Appendix K; "*Thompson's Branch Conceptual Analysis*", Espey Consultants, July 2007. There are 4.0 miles of stream included with the Mountain Creek hydraulic analysis, which computes water surface elevations for the 50%, 20%, 10%, 4%, 2% and 1% annual chance (2-, 5-, 10-, 25-, 50-, and 100-year, respectively) existing and ultimate storm events. The hydraulic analysis includes the delineation of the existing conditions 50%, 20%, 10%, 4%, 2% and 1% annual chance floodplains, and the ultimate conditions 1% annual chance floodplains.

An overall map showing the extents of the studied reaches is included in Exhibit 5 of Appendix A. The USACE HEC-RAS software version 3.1.3 is used for the hydraulic analyses. All modeling is one dimensional. Steady state analyses were performed for both lower Mountain Creek and Thompson's Branch, and an unsteady analysis was performed for lower Mountain Creek. The sections that follow describe the development of the hydraulic models both in general terms and specifics for lower Mountain Creek.

3.1 HYDRAULIC MODEL DEVELOPMENT

3.1.1 Processing

The detailed study methodology incorporated using HEC-GeoRAS software as a preprocessor to HEC-RAS. HEC-GeoRAS utilizes geographically referenced data sets as well as a three-dimensional terrain model to create the input data files for HEC-RAS. The terrain model was developed from NCTCOG 2001 detailed LIDAR data. HEC-RAS is then executed to determine the flood elevation at each cross section of the modeled stream. The resulting elevations are then post-processed by HEC-GeoRAS for creation of the floodplain boundaries.

3.1.2 Cross Section

Model cross sections are placed along the study streams using the available contour data (NCTCOG, 2001). Where roads or other structures are encountered, supplemental cross sections are required to meet HEC-RAS data input needs. An extensive field survey of hydraulic structures was conducted to help enhance the accuracy of the hydraulic model. In addition to hydraulically significant structures, natural cross sections were surveyed. These detailed cross sections are used to enhance the channel portions of the cross sections derived from the terrain model. The HEC-RAS model generated from HEC-GeoRAS then received an extensive quality check / quality assurance to ensure that LIDAR and field survey data were merged correctly.

3.1.3 Parameter Estimation

Tables 8 and 9 document the hydraulic parameters used in the analysis of lower Mountain Creek.

Table 8. Manning's n Values

Type	Value
Channel	
Natural channel, irregular cross section, meandering, brush	0.055
Overbank	
Natural channel, irregular cross section, meandering chanel	0.08
Tree/Brush coverage	0.1
Developed/Residential areas	0.1

Table 9. Manning's n Values

Type	Value
Channel	
Natural channel, irregular cross section, meandering, brush	0.055
Overbank	
Natural channel, irregular cross section, meandering, heavier brush with medium trees	0.08
Tree/Brush coverage	0.1
Developed/Residential areas	0.1

Table 10. Miscellaneous Hydraulic Coefficients

Coefficient Type	Value or Range
Bridge pier drag coefficient for momentum equation applications, Cd	2
Pressure and weir flow coefficient (submerged inlet and outlet), Cd	0.8
Expansion coefficients for bridges / culverts / in-line structures	0.3 to 0.5
Expansion coefficients for channels	0.3
Contraction coefficients for bridges / culverts / in-line structures	0.1 to 0.3
Contraction coefficients for channels	0.1
Weir coefficients (road deck)	2.6 to 3.0
Culvert entrance loss coefficient	0.4
Culvert exit loss coefficient	1

3.1.4 Modeling Considerations

Various considerations are taken into account when evaluating each hydraulic reach. These considerations include, but are not limited to, starting water surface elevations, structure crossings, islands and flow splits, ineffective flow areas, supercritical versus subcritical flow regimes, hydraulic calibration, etc. The sections below describe the various considerations taken into account for the lower Mountain Creek.

Ineffective flow areas are added to portions of various cross sections to accurately model any given section's ability to convey flow. Ineffective flow areas are typically modeled by:

1) applying an ineffective flow area boundary in HEC-RAS with a test elevation that, if exceeded, would offer some level of conveyance,
2) applying a permanent ineffective flow area boundary in HEC-RAS, which will permanently prevent that portion of the cross section from conveying flow,
3) applying a blocked obstruction boundary in HEC-RAS, which will permanently prevent that portion of the cross section from conveying flow and removes storage capacity of the stream.

Examples of temporary ineffective flow areas include 1) minor swales parallel to the reach that eventually outfall into the reach or 2) cross sections immediately upstream or downstream of an in-line structure. Examples of permanent ineffective flow areas include 1) minor swales parallel to the reach, which do not outfall into the reach or 2) off-line water quality / detention ponds.

The effective FEMA model assumed a known water surface elevation as its downstream boundary condition. Careful consideration was given to the downstream boundary condition for this study. The results were reviewed for three different boundary conditions; 1) the known water surface elevation (WSEL) used in the effective model, 2) the 100-Year West Fork Trinity River 100-Year WSEL, and 3) normal depth. The source of the effective WSEL was not known; therefore it was impossible to verify or to determine appropriate values for events other than the 100-Year. Due to relative drainage area sizes, a coincident peak assumption with the West Fork Trinity River is not appropriate. A normal depth assumption was selected as the most appropriate methodology with an assumed slope of 0.002 ft/ft. It should be noted that the resulting floodplain and profiles displayed in this report are for Mountain Creek flows only. A comprehensive floodplain map for Mountain Creek would include the West Fork Trinity River floodplain in all areas that it exceeds Mountain Creek elevations.

3.2 DETAILED DESCRIPTION OF LOWER MOUNTAIN CREEK HYDRAULIC MODEL GENERATION

Lower Mountain Creek (LMC) drains approximately 80.2 square miles downstream of Joe Pool Lake, before outfalling into the West Fork Trinity River. The last detailed study of LMC was conducted in 1999 by Morrison Hydrology Engineering. This study represents the current effective FEMA study. Lower Mountain Creek presents significant flooding risks to adjacent properties due to the relatively flat nature of the floodplain and the large watershed draining to this location. The HEC-RAS model is constructed as one reach, approximately 4.0 miles long. The model consists of 31 cross-sections and six bridges (Jefferson Street is modeled as two separate bridges).

Approximately 70.9 square miles of the drainage basin drains to Mountain Creek Lake, just upstream of the studied reach. Approximately 9.3 square miles (11% of the total drainage basin at the West Fork Trinity River) drains to lower Mountain Creek downstream of Mountain Creek Lake. The flows within the studied reach are dominated by the flows through the dam at Mountain Creek Lake. The relatively small size of the tributary area downstream of the dam and the hydrograph timing results in the downstream sections peaking earlier than the peak discharge at the dam. The valley storage within the floodplain generally results in attenuation and a decrease in peak discharges from the dam to the confluence with the West Fork Trinity River. Lower Mountain Creek is modeled assuming a subcritical flow regime, which is consistent with FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners*, Appendix C.3.4.4.

3.2.1 Steady Analysis

The HEC-HMS nodes and associated flow rates with corresponding cross-section where these flow rates were applied to the existing conditions model are shown in Table 11, and the values for the ultimate conditions model are shown in Table 12.

Table 11. Existing Condition Steady Flow Rates

River Station	HEC-HMS Node	Discharge (cfs)					
		2-YR	**5-YR**	**10-YR**	**25-YR**	**50-YR**	**100-YR**
21776	MCL Dam	15,460	26,420	34,320	43,470	51,370	59,710
15876	TB Junction	15,570	24,840	32,150	42,470	50,560	58,060
12317	Golf Course	15,240	24,630	31,660	40,460	47,430	55,420
8852	IH-30	13,580	22,120	28,290	35,290	41,830	48,810
6679	West Fork	13,520	21,940	28,240	35,260	41,810	48,820

Table 12. Ultimate Condition Steady Flow Rates

River Station	HEC-HMS Node	Discharge (cfs)					
		2-YR	**5-YR**	**10-YR**	**25-YR**	**50-YR**	**100-YR**
21776	MCL Dam	16,910	28,090	36,100	45,210	53,100	61,320
15876	TB Junction	16,790	26,190	33,720	44,650	52,240	59,540
12317	Golf Course	16,620	25,880	33,210	42,110	48,980	56,810
8852	IH-30	14,780	23,080	29,460	36,460	43,170	50,070
6679	West Fork	14,710	22,880	29,410	36,450	43,150	50,090

3.2.2 Unsteady Analysis

Unsteady flow analysis in HEC-RAS differs in many ways from the traditional steady state analysis. The largest difference involves the ability to input a full hydrograph into the model to analyze the response of the river system to flows that vary with time. Additional differences are listed below:

Table 13. Comparison of Steady to Unsteady Solutions

Steady Solution	Unsteady Solution
Energy – profiles computed based on energy losses	Momentum – profiles computed based on sum of forces
Internal energy losses estimated by Manning's and Form Loss equations	External boundary shear represented by Manning's equation
Steady Flow is input (Q=VA) and Inflow = Outflow	Unsteady flow is based on continuity equation (Outflow = Inflow – Storage)

Source: Vernon R. Bonner, 2007

A slight modification had to be incorporated into the HEC-RAS geometry to produce a stable unsteady HEC-RAS run. Because the analysis is done for a wide range of flows over many time steps, the model can be more sensitive at low flow rates and when flows approach critical. To encourage model stability, a small pilot channel was added to the geometry to guarantee flow in the downstream direction and reduce the effective slope for low flow rates. A pilot channel five feet wide with an assumed Manning's n value of 0.04 was added to the entire reach. This pilot channel is small enough to have no effect on the calculated water surface elevation for any of the studied events.

In addition, the HEC-HMS data was applied to the model in a slightly different manner and at different locations. It would not be appropriate to use the calculated confluence hydrographs within the study reach since these quantities include modified Puls routing information generated by the steady HEC-RAS model. Using these data would potentially be double-counting valley storage and over-estimating peak attenuation. Therefore, the individual sub-basins that confluence with

Mountain Creek within the study reach were added as lateral inflow hydrographs. The HEC-HMS flow data were applied as shown in Table 14.

Table 14. Unsteady Analysis Boundary Conditions

River Station	Boundary Condition Type	HEC-HMS Node
21776	Flow Hydrograph	MCL Dam
20811	Lateral inflow Hydrograph	LMC-01
17900	Lateral inflow Hydrograph	TB_A Junction
13618	Lateral inflow Hydrograph	LMC-02
12317	Lateral inflow Hydrograph	LMC-03
7847	Lateral inflow Hydrograph	LMC-04
5354	Lateral inflow Hydrograph	LMC-05
863	Normal Depth - 0.002	n/a

3.3 HYDRAULIC ANALYSIS SUMMARY AND CONCLUSIONS

The ultimate conditions steady-state calculated water surface elevations are very similar to existing conditions. The flow rates for the 1% event are 2 to 3% greater in the ultimate conditions than existing but this does not translate to a significant increase in depth. The calculated water surface elevations are an average of 0.2 ft higher in the ultimate conditions, with the largest increase being 0.3 ft.

The difference between the steady state results and the unsteady results are much more pronounced. These differences are most likely the cause of different routing techniques. The effects of valley storage and related peak attenuation are accounted for by the modified Puls routing in HEC-HMS in the steady state model and are calculated by HEC-RAS in the unsteady model. In addition, the unsteady HEC-RAS model shows storage impacts and calculated effects for each individual cross-section, while the steady model is limited to the larger routing reaches as defined within HEC-HMS. The routed HEC-HMS results are applied to the HEC-RAS cross section locations in a conservative manner to ensure that any inherent errors do not under-estimate calculated water surface elevations. It would be expected for flow rates to be generally lower if each cross-section were analyzed independently. The steady analysis also models the peak flow rate for each confluence without respect to the timing. Timing of peaks in different parts of the model can have a significant impact on tailwater conditions and greatly impact computed water surface elevations.

The existing condition 1% annual chance event water surface profile was compared to the effective FEMA model results. It should be noted that the flow rates differ for these two analyses, with the effective model having much lower flow rates in the downstream portion of this reach. Generally the results from this study were very similar to the effective model.

The differences between the effective FEMA model and the existing conditions steady and unsteady models shown in Figure 6 can most likely be attributed to the following causes:

1) Flow Rates – The effective model has a much lower flow rate for the downstream section of lower Mountain Creek. The original hydrologic model was not available for review and the source of the difference could not be established.

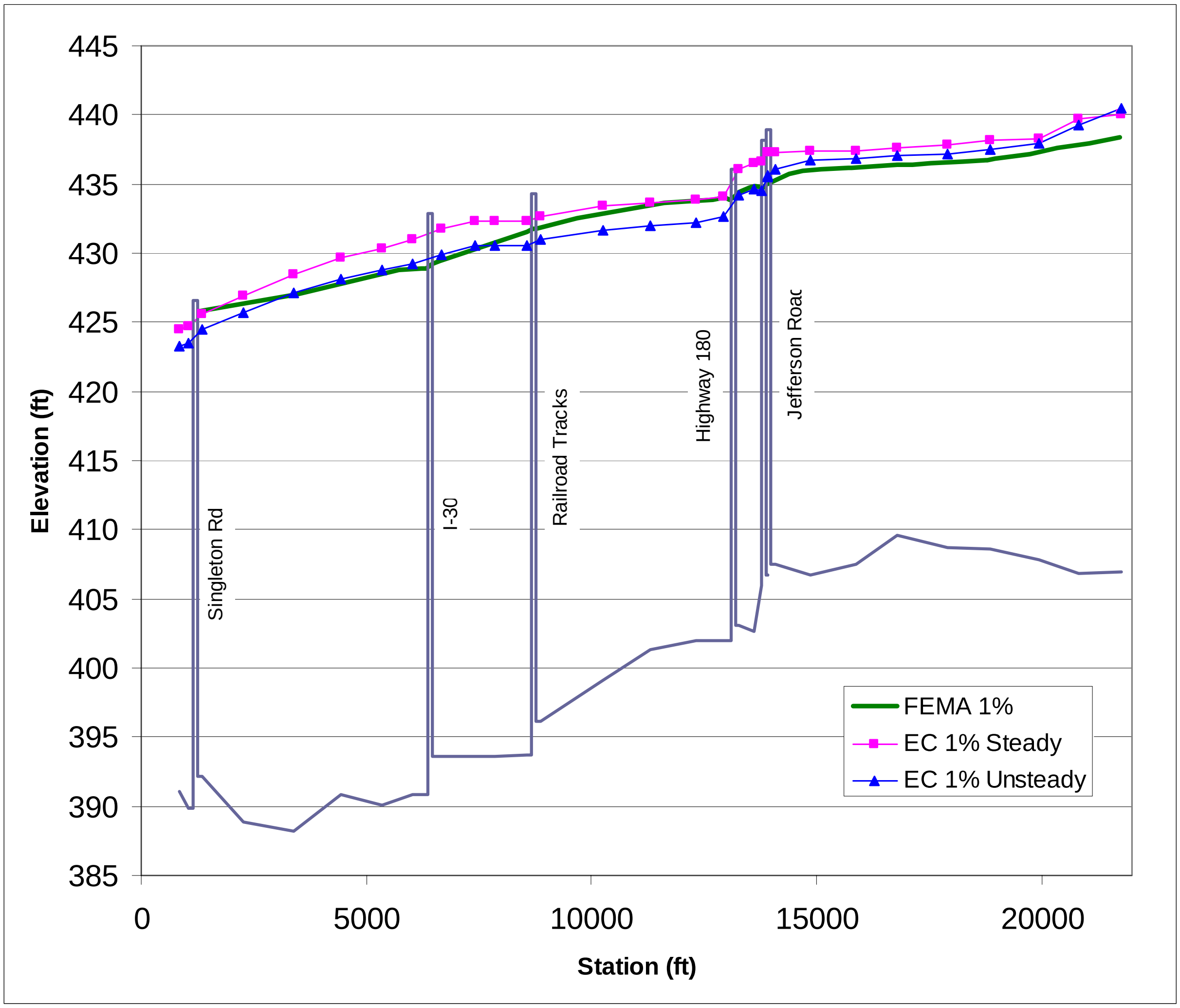

Figure 5: 1% Existing Profile Comparison

2) Boundary Condition – The effective model uses a known water surface elevation as the downstream boundary condition while both the steady and unsteady models use a normal depth assumption. The lower Mountain Creek has a relatively low slope and the boundary condition assumption can effect calculated water surface elevations for the entire reach.

3) Bridge Modeling – The current study uses new survey for the bridge geometry for the lower Mountain Creek. This geometry appears significantly different from that used in the effective model, and this does affect results.

The existing conditions floodplains are shown on Exhibit 6 in Appendix A. It is interesting to note that the 20% (5-Year) event encompasses most of the area included within the 1% (100-Year) floodplain. Exhibit 7 in Appendix A shows a comparison of the calculated 1% (100-Year) existing floodplains and the effective FEMA floodplain. Exhibit 8 shows the existing 1% (100-Year) floodplain over an aerial photo. Exhibit 9 shows a comparison of the calculated 1% existing and ultimate floodplains. The areal extent of the ultimate floodplain is very similar to the existing floodplain.

4.0 FLOOD MITIGATION ALTERNATIVES

The Mountain Creek Flood Protection Plan evaluated six (6) alternative solutions to mitigate the effects of flooding in the lower Mountain Creek watershed and provides the City an assessment of which alternative provides the greatest benefit in relationship to the cost. The proposed alternatives are intended to deal with nuisance flooding from both localized rainfall events and from Mountain Creek. To assist the City in prioritizing which projects should be funded, the alternatives are assessed with a combination of cost of implementation and associated benefits. All recommendations presented in this report are subject to approval and available funding. The six alternatives analyzed are described as follows:

- **Alternative 1**: Central Channel Improvements;
- **Alternative 2**: West Channel Improvements;
- **Alternative 3**: Demolition of Eastbound Jefferson Street overbank roadway and culverts (in conjunction with Alternatives 1 and 2);
- **Alternative 4**: Additional Upstream Detention;
- **Alternative 5**: Improved Secondary Channels (Alternatives 1, 2, and 3) & Upstream Detention (Alternative 4); and,
- **Alternative 6**: Main Channel Improvements.

The study area was divided into three planning areas for the purposes of the alternative analyses. These areas are the Race Track/Golf Course Area, the Intermediate Roadway Area, and the Thompson's Branch Area. The three main Mountain Creek channels that traverse these areas are referred to as the West Channel, the Central Chanel and the Main Branch. Specific locations of these areas are shown on Figure 7.

Each of these alternatives is discussed in the subsections that follow. The cost-benefit analysis is a preliminary estimate of construction costs based on recent bid tabulations provided by the City of Grand Prairie and cost estimation provided by a local contractor. Some alternatives may require a Section 404 permit from the U.S. Army Corps of Engineers. The preliminary cost estimates are provided in Appendix I.

A levee alternative was not examined as a part of this study as it has been previously studied in the Upper Trinity River Reconnaissance Study performed by the US Army Corps of Engineers in 1990. The proposed levee alignment from that study is presented as Exhibit 10 in Appendix A. This alternative consisted of three miles of levee and four miles of channel realignments. The estimated cost of this alternative was $6.5 million. This cost was in 1990 dollars and did not include conservation of valley storage required by NCTCOG, permitting, or environmental mitigation. It was determined for the purposes of this study that permitting (USACE) and NCTCOG requirements would make a levee alternative of this size too expensive and/or impossible to implement.

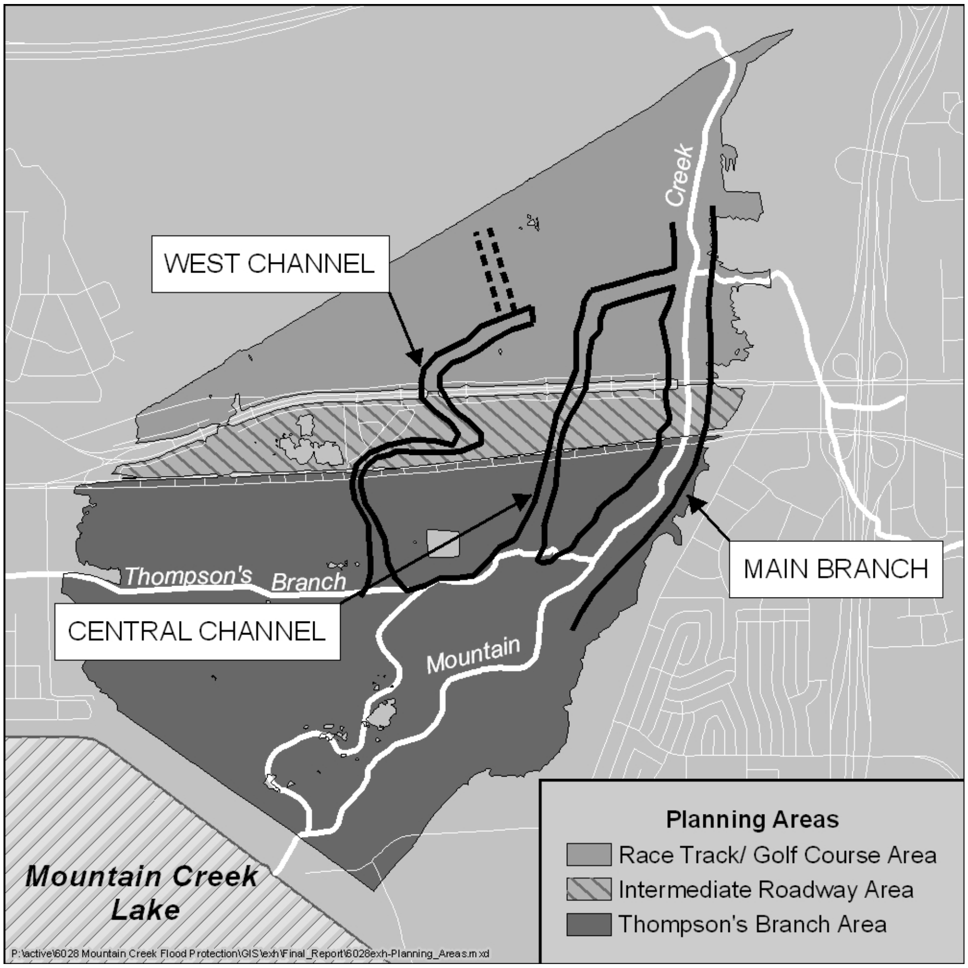

Figure 6: Alternative Planning Areas

4.1 ALTERNATIVE 1 – CENTRAL CHANNEL IMPROVEMENTS

The first flood mitigation alternative involves improving the central channel in order to facilitate conveyance for Mountain Creek flood flows. Another benefit from this alternative would be the addition of valley storage and improvements to local drainage along the center of the study area. The effectiveness of this alternative is contingent upon reestablishing conveyance through the entire length of the central channel, from the south side of Jefferson Street through the golf course to the main branch of Mountain Creek. The location is shown on Exhibit 11 in Appendix A. The primary elements of the central channel improvements include:

- construction of a new channel south of Jefferson Street;
- improvements to the eastbound Jefferson Street culvert system – or demolition of eastbound roadway (see Alternative 3);
- reestablishment of channel north of Jefferson Street; and,
- improvements to the channel through Sunset Golf Course.

4.1.1 Thompson's Branch Area

Implementation of Alternative 1 would require construction of a new channel to convey flows from Thompson's Branch and Mountain Creek downstream through the central channel. Currently, no channel exists where the FEMA effective model and floodway show the central channel to be. In order to effectively convey flow and reestablish the floodway, an earthen channel with a bottom elevation of approximately 426 feet MSL, a bottom width of 100 feet, and side slopes of 4:1 (horizontal to vertical) extending approximately 800 feet is proposed. The proposed channel will abut the eastbound Jefferson Street roadway and convey flow downstream through the proposed culvert system (or through an extended channel – see Alternative 3). Since fill has been placed to a maximum elevation of 434 feet on the south side of Jefferson Street, up to 8 feet of cut may be required, contributing to an estimated total cut of 22,000 cubic yards (CY). It is assumed that 100% of the excavated material can be placed and compacted as site fill on adjacent properties.

The easement required for the 100-foot wide channel with a 20-foot maintenance road is approximately 190 feet wide. Total easement area requirement is approximately 3.5 acres, less any existing easements already owned by the City.

Implementation of Alternative 1 (without corollary Alternative 3) will require a new culvert system to convey flow under the eastbound lanes of Jefferson Street to the Intermediate Roadway Area at the central channel. In order to effectively convey flow, a system of 3 – 4 feet x 4 feet, 60 feet long concrete box culverts is proposed. Installation of the proposed multiple box culvert (MBC) will require temporary closure of the two eastbound lanes of Jefferson Street

4.1.2 Intermediate Roadway Area

Implementation of Alternative 1 will require reestablishment of the central channel to convey flows through the Intermediate Roadway Area. In order to effectively convey upstream flow and local drainage, an earthen channel with a bottom elevation of 426 feet MSL, a bottom width of 130 feet, and side slopes of 4:1 (horizontal to vertical) extending approximately 700 feet is proposed. The proposed channel will receive flow from the new Jefferson Street culvert system (or from an extended channel – see Alternative 3) and convey flow downstream through the existing Main Street bridge. Since fill has been placed to a maximum elevation of 432 feet on the north side of Jefferson Street, up to 6 feet of cut may be required, contributing to an estimated total cut of 24,000 cubic yards (CY).

The easement required for the 130-foot wide channel with a 20-foot maintenance road is approximately 200 feet wide. Total easement area requirement is approximately 3.2 acres, less any existing easements already owned by the City.

4.1.3 Race Track / Golf Course Area

Implementation of Alternative 1 may require improvement to the existing golf course channel to complete conveyance through the central channel. In order to effectively convey upstream flow and local drainage, an earthen channel with a bottom elevation of 423 feet MSL, a bottom width of 60 feet, and side slopes of 4:1 (horizontal to vertical) extending approximately 500 feet to the northeast is proposed. The improved channel will receive flow from the existing central channel north of

Main Street and convey flow downstream to the main branch of Mountain Creek. Improvements to the existing golf course channel would require an estimated total cut of 5,000 cubic yards (CY). It is assumed that 100% of the excavated material can be placed and compacted as site fill on adjacent properties.

The easement required for the 60-foot wide channel with a 20-foot maintenance road is approximately 120 feet wide. Total easement area requirement is approximately 1.4 acres, less any existing easements already owned by the City.

4.1.4 Cost-Benefit Analysis

Cost

Any proposal to widen and reshape of the existing waterways using mechanical equipment through cut and fill methods such as the Golf Course channel improvement would likely require an Individual Section 404 Permit because of the length of the channel impacted. An Individual Permit requires the submittal of detailed mitigation plans in addition to the proposed channel construction plans. Processing of an Individual Permit can be expected to take anywhere from 12 to 24 months for approval with 3-5 years monitoring of mitigation measures after construction. Permitting costs for this type of permit will be approximately $70,000 with mitigation costs estimated to be $500,000 or more.

It is possible for Alternative 1 to be accomplished with either a Nationwide Permit (NWP) or potentially no permit. To accomplish this, proposed improvements to existing waterways should be "benched" above the limits of the jurisdictional waters and connections of "new" channels to existing waterways should minimize impacts. All mechanical excavation should be done or at least started using bucket excavators from the top of the channel bank and caution is required to ensure that no material be spilled into jurisdictional area. The project is considered complete on re-establishment of vegetation and completion of all mitigation measures.

The proposal to use a NWP may require additional hydraulic modeling and may slightly increase the channel top width and easement requirements where utilized. The schedule for processing of a NWP is approximately 6 to 12 months assuming no significant mitigation measures are required. The permitting cost for this alternative is approximately $40,000 if a NWP is applicable.

The total probable construction cost estimate for Alternative 1 (without corollary Alternative 3) including a NWP with 15% contingency and 20% engineering and surveying is approximately $1,510,000. It should be noted that optional improvements to the Golf Course channel represent approximately $210,000 of this total. Details of cost estimation are provided in Appendix I.

Benefit

The benefits of Alternative 1 include reestablishment of the regulatory floodway conveyance through the central channel, improvements to local drainage, and limited reduction (less than 0.5 feet) of Mountain Creek flood water surface elevations (WSELs). Additionally, approximately 51,000 CY of cut generated by channel improvements could be used to raise adjacent properties while preserving regional valley storage.

4.2 ALTERNATIVE 2 – WEST CHANNEL IMPROVEMENTS

The second flood mitigation alternative involves improving the west channel in order to facilitate conveyance for Mountain Creek flood flows. This alternative would also provide additional valley storage and facilitate local drainage along the west side of the study area. While there are many options and levels of involvement available for this alternative, its effectiveness is contingent upon reestablishing conveyance through the entire length of the west channel, from Thompson's Branch to the railroad embankment ditch. The location is shown on Exhibit 12 in Appendix A. The primary elements of the west channel improvements include:

- Improvements to existing channel upstream of Jefferson Street;
- improvements to the eastbound Jefferson Street culvert system – or demolition of the eastbound roadway (see Alternative 3);
- buy-out and/or modification of the Willow Bend mobile home park; and,
- construction of a new channel west of the drag racing facility.

4.2.1 Thompson's Branch Area

The Letter of Map Revision (LOMR) dated August 23, 2005 documented the reduction of the floodway within the existing west channel. As a result of channel improvements, the west channel is graded to drain local flows from Jefferson Street to the south towards Thompson's Branch. Implementation of Alternative 2 may require improvements to the channel to redirect local drainage to the north through Jefferson Street. The proposed channel would have an approximate bottom elevation of 423 feet MSL, a bottom width of 60 feet, side slopes of 4:1 (horizontal to vertical), and would extend approximately 750 feet south of eastbound Jefferson Street. The improved channel will receive flow from Thompson's Branch and convey flow downstream to Jefferson Street. Improvements to the existing channel would require an estimated total cut of 5,000 cubic yards (CY). It is assumed that 100% of the excavated material can be placed and compacted as site fill on adjacent properties.

Implementation of Alternative 2 (without corollary Alternative 3) will require a new culvert system under the eastbound lanes of Jefferson Street to convey flow from Thompson's Branch and Mountain Creek downstream through the west channel. In order to effectively convey flow, the existing system will be replaced by 3 – 4 feet x 4 feet, 100 feet long concrete box culverts. Installation of the proposed multiple box culvert (MBC) will require temporary closure of the two eastbound lanes of Jefferson Street

4.2.2 Intermediate Roadway Area

The primary flood problem area within the Intermediate Roadway Area along the west channel is the Willow Bend mobile home park. While flood protection of the mobile home park with a levee is possible, it is not considered a viable alternative for three reasons:

1. Pumping of the area behind the levee during rainfall events would be required and is not considered a feasible or cost effective option;

2. Compensation of volume removed from the floodplain will be required to maintain regional valley storage; and,

3. Backwater conditions in the west channel would remain a flood problem based on downstream floodplain elevations.

Therefore, due to its proximity to the channel and extremely low elevation, protection of the mobile home park is not a feasible option and buy-out of the property is recommended as the only viable method to provide flood protection to the residents.

Alternative 2 includes several options for use of the unsalvageable mobile home park after buy-out:

- No further action after buy-out;
- Restoration of mobile home property and reclaim as parkland; and/or
- Excavation of mobile home park property and fill of adjacent properties, thus reducing the west channel floodway within the Intermediate Roadway Area to undeveloped property and wetlands. This would provide additional storage of flood flows and a wetlands mitigation area for other potential improvements.

Excavation of the mobile home park down to an elevation of 426 feet MSL would require an estimated total cut of 67,000 cubic yards (CY). It is assumed that 100% of the excavated material can be placed and compacted as site fill on adjacent properties.

4.2.3 Race Track / Golf Course Area

Implementation of Alternative 2 will require construction of a new channel to complete conveyance through the west channel. In order to effectively convey upstream flow and local drainage, an earthen channel with a bottom elevation of 422 feet MSL, a bottom width of 80 feet, and side slopes of 4:1 (horizontal to vertical) extending approximately 1,350 feet along the western boundary of the drag racing facility is proposed. The new channel will receive flow from the existing west channel south of the drag racing facility and convey flow to the railroad embankment channel, which extends approximately one half mile to the northeast to the main branch of Mountain Creek. Construction of the new channel would require an estimated total cut of 38,000 cubic yards (CY). It is assumed that 100% of the excavated material can be placed and compacted as site fill on adjacent properties.

The easement required for the 100-foot wide channel with a 20-foot maintenance road is approximately 170 feet wide. Total easement area requirement is approximately 5.3 acres, less any existing easements already owned by the City.

4.2.4 Cost-Benefit Analysis

Cost
Section 404 Individual and Nationwide Permit considerations, costs and schedules are the same as described above for Alternative 1 in Section 4.1.4.

The total probable construction cost estimate for Alternative 2 (without corollary Alternative 3) including buy-out and excavation of the Willow Bend mobile home park, a NWP with 15% contingency, and 20% engineering and surveying is approximately $11,010,000. However, several options are available for use of the mobile home park, and other provisions of Alternative 2 could be accomplished without buy-out/excavation, reducing the cost by approximately $8,330,000. Details of cost estimation are provided in Appendix I.

Benefit

The benefits of Alternative 2 include improved secondary conveyance for Mountain Creek flood flows through the west channel, improvements to local drainage, establishment of positive drainage in the west channel through Jefferson Street, and limited reduction (less than 0.5 feet) of Mountain Creek flood WSELs. Additionally, approximately 110,000 CY of fill generated by channel improvements could be used to raise adjacent properties.

4.3 ALTERNATIVE 3 – DEMOLITION OF EASTBOUND JEFFERSON STREET ROADWAY AND CULVERTS

The third flood mitigation alternative is a corollary to Alternatives 1 and 2. This alternative involves abandonment and demolition of the two eastbound (upstream) lanes of Jefferson Street in order to facilitate conveyance for Mountain Creek flood flows and local drainage through the central and west channels. This alternative will also require rerouting of eastbound traffic to one of the existing westbound Jefferson lanes. While this alternative will be beneficial when paired with Alternatives 1 or 2 individually, the full benefit may be realized in conjunction with both Alternatives 1 and 2. It should be noted that Alternative 3 may be implemented as a stand-alone option; however, the benefits would be insignificant without the improved conveyance provided by Alternatives 1 and/or 2. The location is shown on Exhibit 13 in Appendix A. The primary elements of this corollary alternative include:

- Re-routing eastbound Jefferson Street traffic to one of the two existing westbound Jefferson lanes and limiting westbound traffic to the remaining single westbound lane
- Demolition of eastbound Jefferson Street roadway at the central and west channels
- Re-establishment of central channel through Jefferson Street
- Re-establishment of west channel through Jefferson Street

Implementation of Alternative 3 would provide secondary conveyance from Thompson's Branch and Mountain Creek to the downstream areas and would reduce flooding caused by local drainage and flow from Mountain Creek. Unlike the existing westbound Jefferson Street roadway, the existing eastbound Jefferson Street roadway has no bridges over the central and west channels and lies at relatively low elevation. In flood events, the roadway acts as a weir and impedes conveyance of Mountain Creek flows. During flood events as frequent as the 20% annual chance (5-year) storm, the eastbound lanes of Jefferson Street are completely inundated by Mountain Creek flows and traffic must be rerouted to the higher westbound lanes.

Excavation associated with the reestablishment of the central channel down to an elevation of 426 feet MSL and west channel down to an elevation of 423 feet MSL would require an estimated total cut of 5,000 cubic yards (CY). It is assumed that the excavated concrete, asphalt, and soil will be hauled to the nearest Type IV municipal solid waste facility for disposal.

Since the existing eastbound Jefferson Street roadway is public right-of-way, no easement would be required for the channel extensions through the roadway.

4.3.1 Cost-Benefit Analysis

Cost

Section 404 Individual and Nationwide Permit considerations, costs and schedules are the same as described above for Alternative 1 in Section 4.1.4; however, if corollary Alternative 3 is implemented in conjunction with Alternative 1 and/or 2, an Individual Permit may be required.

While there will be costs associate with closure of the eastbound lanes (traffic striping, signage, etc.), major alternative routes are within close proximity to Jefferson Street (Main Street and Interstate Highway 30); therefore, the impact of reducing Jefferson Street from four lanes to two lanes could be relatively low. A more detailed traffic impact study is required to estimate the total cost of closing the eastbound lanes of Jefferson Street

The total probable construction cost estimate for the addition of corollary Alternative 3 to both Alternatives 1 and 2 including a NWP with 15% contingency and 20% engineering and surveying is approximately $300,000 (plus the cost of culvert improvements included in Alternatives 1 and 2)**.** Details of cost estimation are provided in Appendix I.

Benefit

The benefits of Alternative 3 include improved secondary conveyance for Mountain Creek flood flows through both the central and west channels, improvements to local drainage, establishment of positive drainage connections through Jefferson Street, and limited reduction (less than 0.5 feet) of Mountain Creek flood WSELs. Additionally, fill generated by road demolition could be used to raise adjacent properties.

Implementation of Alternative 3 would also reduce traffic impacts and improve driver safety during flood events. Since the eastbound lanes of Jefferson Street, which are overtopped during flood events as frequent as the 5-year storm, will be permanently closed to traffic, placement of up to eight traffic barriers will no longer be required and the likelihood of vehicle wash-off will be greatly reduced.

4.4 ALTERNATIVE 4 – ADDITIONAL UPSTREAM DETENTION

The fourth flood mitigation alternative involves increasing flood storage upstream of the Mountain Creek Lake (MCL) Dam. Providing additional upstream storage of flood flows could potentially reduce Mountain Creek flood WSELs and floodplains in the lower watershed, provide improved water quality to MCL and downstream areas, provide regional storm water detention, minimize the amount of local storm water detention required, and potentially provide compensatory valley storage for the filling of flood prone areas in the lower watershed. Additional upstream detention may be attained by any combination of the following three subalternatives:

4A. Modification of MCL operations

4B. Construction of a large regional detention facility immediately upstream of MCL

4C. Construction of multiple smaller regional detention facilities in upper watershed

It should be noted that a combination of subalternatives 4A, 4B, and/or 4C may result in the most feasible and cost effective alternative due to the unique easement and construction cost restraints associated with each subalternative. While there are many options and levels of involvement available for each subalternative, the net increase in upstream flood storage attained is paramount to the effectiveness of the alternative as a whole.

4.4.1 Alternative 4A – Modification of Mountain Creek Lake Operations

Alternative 4A involves increasing upstream flood storage by modifying the operation of Mountain Creek Lake to allow additional rise during a flood event. The existing conditions model is based on the current Exelon operating procedures for the Mountain Creek Lake Dam. The dam gates are opened manually to pass all flows. This typically results in approximately one foot of rise in the lake during a significant flood event. For this alternative, we examined the impacts of allowing additional lake storage prior to discharge. This could be accomplished by limited pre-releases of flow to drawdown the lake surface. In combination with a drawdown or by itself, the lake could be allowed to rise further by an additional 1, 2, or 3 feet. The exact location and extent of areas impacted by this alternative would be determined in final design. Exhibit 14 in Appendix A shows the general areas that could be impacted if inundation limits within Mountain Creek Lake were modified. Table 15 shows the HEC-HMS model results for the 1% annual chance event of different lake storage volume assumptions at three locations:

- MCL Dam – immediately downstream of Mountain Creek Lake Dam;
- TB Junction – immediately upstream of Jefferson Street at the junction of Mountain Creek and Thompson's Branch; and,
- West Fork – at the model outlet to the West Fork Trinity River.

Table 15. Additional Mountain Creek Lake Storage Flow Impacts (1% Event)

Rise (ft)	Approx. Additional Storage (ac-ft)	MCL DAM (cfs)	TB JUNCTION (cfs)	WEST FORK (cfs)
0	0	67,814	62,128	50,441
1	2,395	59,709	58,059	48,819
2	4,790	52,845	52,279	46,088
3	7,185	46,896	46,474	43,357
4	9,580	42,227	43,061	40,526

Cost

Modification of Mountain Creek Lake operations will impact all lakeside properties; however, these properties are limited to, in large part, parks and a golf course. There is no known associated cost with this option unless the City or Exelon needs to purchase inundation easements for adjacent properties. A modification to the lake operation could also greatly impact normal facility operations for Exelon. Exelon uses Mountain Creek Lake for cooling water for its electrical generators and they have stated that the cooling intake can only access lake waters if the pool elevation is within a 1.5 foot range from normal level. Pre-release of lake water prior to a forecast storm and increases to maximum pool elevation could increase the frequency that cooling water is not available for use. The associated cost of these changes has not been quantified for this alternative.

Increasing the storage (maximum pool elevation) of Mountain Creek Lake could also potentially affect the structural integrity of the MCL Dam. Therefore, a detailed analysis of structural impacts and potential costs to improve the dam would be required prior to implementation.

Benefit

The main benefit of Alternative 4A would be the significant reduction of Mountain Creek flood flows in the lower watershed. Table 15 shows the benefit of additional lake storage. For comparison purposes, the 25-year existing conditions flows at each node are 43,470 cfs, 42,470 cfs, and 35,260 cfs, respectively. Altering the operation plan to allow a total of four feet of rise (or 9,580 ac-ft of additional storage) in extreme storm conditions reduces the 100-year flow to approximate the existing 25-year flow upstream of the Main Street Bridge. It should be noted that this flow reduction would result in WSELs 1-1.5 feet lower than existing. However, the areal extent of floodplain reduction is limited due to the wide, flat nature of the overbank.

4.4.2 Alternative 4B – Mountain Creek Regional Storm Water Detention

Alternative 4B involves increasing upstream flood detention by construction of a large regional storm water detention facility immediately upstream of MCL. The proposed pond location lies mostly within Mountain Creek Lake Park, undeveloped properties owned by Exelon and the City of Grand Prairie, and the Grand Prairie Country Club Golf Course. The location is shown on Exhibit 15 in Appendix A.

In order to minimize dam safety requirements, it is recommended that the dam height not exceed six feet; however, if conditions allow, the dam could be raised to increase the storage volume. Based on a dam height of six feet, an average depth of four feet, and an approximate WSE of 464 feet MSL, the proposed pond would cover approximately 1,350 acres and provide an additional 5,400 ac-ft of flood storage.

Since the proposed pond is located in the existing channel, only construction of the dam would be required. It is assumed that an earthen dam could be constructed with approximately 40,000 CY excavated from the upstream channel. Additional storage could be attained and dam safety requirements minimized by further excavation of the channel upstream of the dam to deepen the pond. However, extensive excavation of the channel may incur additional Section 404 permitting requirements.

Two large creeks, Fish Creek and Kirby Creek, would drain directly to this detention pond. Both creeks have existing flooding issues caused by backwater and some erosion issues. The detention pond described above is not expected to impact these existing problems, with the exception of a minor increase in flooding in the creeks immediately adjacent to the proposed pond. Additional study would be required to determine the specific impacts of Alternative 4B to these creeks.

Cost
Construction of a large regional detention facility will require the acquisition of properties upstream of MCL that may not be currently owned by the City of Grand Prairie. Based on a WSEL of 464 feet MSL, approximately 1,350 acres must be acquired, including most of the Grand Prairie Country Club Golf Course. The dam could be constructed further upstream to reduce the area to approximately 950 acres and exclude the golf course; however, this would reduce the storage volume to approximately 3,800 ac-ft.

Section 404 Individual and Nationwide Permit considerations, costs and schedules are the same as described above for Alternative 1 in Section 4.1.4.

The total probable construction cost estimate for Alternative 4B, based on a 1,350-acre pond with a WSE of 464 ft MSL, including a NWP with 15% contingency and 20% engineering and surveying is approximately $33,600,000**.** Details of cost estimation are provided in Appendix I.

Benefit
The main benefit of Alternative 4B would be the significant reduction of Mountain Creek flood flows in the lower watershed as noted the Alternative 4A discussion above. In addition to providing storm water detention, the facility could include a sediment forebay and provide a significant water quality benefit to MCL. While existing wetlands may be disturbed by construction of the facility, the pond could provide a natural habitat for wildlife and wetlands could be restored.

4.4.3 Alternative 4C – Upper Watershed Regional Storm Water Detention

Alternative 4C involves increasing upstream storm water detention by construction of multiple smaller regional storm water detention facilities in the upper watershed. The upper watershed consists of mostly commercial and residential properties with some industrial use. Approximately 40, 40-acre, 6 feet deep ponds would be required to provide storage equivalent to a four foot rise in Mountain Creek Lake (Alternative 4A), and approximately 23, 40-acre, 6 feet deep ponds would be required to provide storage equivalent to the 5,400 ac-ft Mountain Creek regional storm water detention pond (Alternative 4B).

Cost
Construction of multiple regional detention facilities would require the acquisition of properties not currently owned by the City of Grand Prairie. For the proposed 40, 240 ac-ft ponds, approximately 1,600 acres must be acquired. Implementation of Alternative 4C would incur significantly more construction cost compared to Alternative 4B since it would require construction of multiple ponds located throughout the more developed upper watershed.

Since local detention facilities could be located outside of waters of the U.S., Section 404 Individual and NWP requirements may not apply.

The total probable construction cost estimate for Alternative 4C, based on the scenario of 40, 240-ac-ft ponds (equivalent storage to four feet of rise in MCL), including a 15% contingency and 20%

engineering and surveying is well over $400,000,000**.** Details of cost estimation are provided in Appendix I.

Benefit
The main benefit of Alternative 4C would be the significant reduction of Mountain Creek flood flows in the lower watershed as noted above.

4.4.4 Potential Benefits of Alternatives 4A, 4B, and 4C

The primary potential benefits of increasing storm water storage upstream of the study area include:

- reduction of detention requirements for individual upstream sites
- offset of valley storage requirements below the MCL Dam allowing fill of areas within the floodplain

While these benefits could be very significant, they require further investigation and coordination with the Trinity River Corridor Development Certificate (CDC) review program and local drainage authorities to determine their feasibility.

The 1% annual chance flood volume difference at MCL Dam between existing and ultimate conditions is approximately 889 ac-ft, which accounts for a 3% flood volume increase. While storage would be required for this volume increase, the additional storage provided by Alternatives 4A, 4B, and 4C could potentially offset storage requirements for future upstream development. Since the proposed alternatives are intended to reduce downstream flooding by storage of up to 9,580 ac-ft, the addition of 889 ac-ft of storage to account for ultimate conditions could be attained relatively easily. A regional storm water management program could be established to pass the cost of alternative implementation to upstream developers who would benefit from reduced detention requirements. Since the reduction of detention requirements would require the modification of local drainage and development policies, further investigation is required to quantify this potential benefit.

The CDC defines valley storage as the temporary storage of floodwater provided by the channel and overbank areas of the floodplain, whether natural or developed. Per CDC requirements, no loss in valley storage is allowed for the base flood throughout the 100-year floodplain. If a planned structure would reduce valley storage, excavation must increase valley storage by an equal amount. Alternatives 4A, 4B, and 4C could be implemented to provide a net gain in valley storage, which may allow for an equivalent volume of fill on flood problem areas in the lower watershed. However, the MCL Dam is the upstream boundary of the Trinity River Corridor, and storage gained outside the corridor (upstream of the dam) may not be considered to offset fill within the corridor. Therefore, further investigation is required to quantify this potential benefit.

4.5 ALTERNATIVE 5 – IMPROVED SECONDARY CHANNELS & MODIFICATION OF MOUNTAIN CREEK LAKE OPERATIONS

The fifth flood mitigation alternative involves a combination of Alternatives 1, 2, 3, and 4A in order to reduce and facilitate conveyance of Mountain Creek flood flows downstream of the dam. The effectiveness of this alternative is contingent upon reestablishing conveyance through the entire length of the central and west channels and the addition of upstream storage in Mountain Creek Lake. The primary elements of this alternative include:

- improvements to the central channel (Alternative 1);
- improvements to the west channel (Alternative 2);
- demolition of eastbound Jefferson Street roadway at the central and west channels (Alternative 3); and,
- modification of Mountain Creek Lake operations to allow four feet of rise (Alternative 4A).

4.5.1 Cost-Benefit Analysis

Cost
The estimated implementation cost of Alternative 5, including permitting requirements, easement acquisition, contingency, engineering and surveying, is simply the sum of Alternative 1, 2, 3, and 4A costs discussed in the previous sections. However, ultimate costs associated with Alternative 4A are unknown at this time. Therefore, the total probable construction cost estimate for Alternative 5 is approximately $15,900,000 plus additional costs associated with Alternative 4A. It should be noted that optional improvements to the central channel at the Golf Course and buy-out/excavation of the mobile home park represent approximately $210,000 and $8,330,000 of this total, respectively. Details of cost estimation are provided in Appendix I.

Benefit
The benefits of Alternative 5 include reestablishment of the regulatory floodway conveyance through the central and west channels, improvements to local drainage, and limited reduction (less than 2 feet) of Mountain Creek flood WSELs. Additionally, approximately 160,000 CY of cut generated by channel improvements could be used to raise adjacent properties while preserving regional valley storage. Exhibits 16 and 17 show the estimated reduction of the floodplain downstream of the dam as a result of Alternative 5 implementation in 100-year and 10-year flood events.

4.6 ALTERNATIVE 6 – MAIN CHANNEL IMPROVEMENTS

The sixth viable flood mitigation alternative involves improving the main stem of Mountain Creek in order to facilitate conveyance of flood flows. This alternative includes the extension (or replacement) of the two Jefferson Street bridges and the Main Street bridge and widening of the channel in the vicinity of the bridges. While there are many options and levels of involvement available for this alternative, its effectiveness is contingent upon improving conveyance of flood flows through the main stem of Mountain Creek. As shown on Exhibit 18, the primary elements of the main stem improvements include:

- extension or replacement of the eastbound Jefferson Street bridge;
- extension or replacement of the westbound Jefferson Street bridge;
- extension or replacement of the Main Street bridge; and,
- excavation of the channel banks through the Intermediate Roadway Area.

4.6.1 Bridge Improvements

Implementation of Alternative 6 would require the widening of the two Jefferson Street bridges and the Main Street bridge, which currently limit the effective flow width in the main stem to approximately 525 feet. In order to obtain significant benefits, the effective flow area must be widened to approximately 700 feet. Extension of the bridges would involve extensive construction and could potentially require demolition and replacement of the bridges. It is assumed that extension of bridge would occur on the west bank of the Mountain Creek as to minimize construction activities and disturbances on property within the City of Dallas.

4.6.2 Channel Improvements

In order to fully realize the benefits of wider bridge spans, the channel of the main stem would also be widened. This would be accomplished by excavating the channel banks to the bridge abutments of the extended bridges, widening the channel through the Intermediate Roadway Area by approximately 400 feet. The channel bank excavations would have approximate bottom elevations ranging from 415 feet MSL upstream to 410 feet MSL downstream (approximately 8 feet higher than the channel bottom) and side slopes of 3:1 (horizontal to vertical). Excavation of the channel banks from approximately 200 feet upstream of the eastbound Jefferson Street Bridge to approximately 200 feet downstream of the Main Street bridge would require approximately 400,000 CY of cut. It is assumed that 100% of the excavated material could be placed and compacted as site fill on adjacent properties. The easement area required for the improved channel with a 20-foot maintenance road is approximately 15 acres, less any existing easements already owned by the City.

4.6.3 Cost-Benefit Analysis

Cost
Section 404 Individual and Nationwide Permit considerations, costs and schedules are the same as described above for Alternative 1. By excavating the channel banks only and avoiding construction activities within jurisdictional waters, permitting requirements may be reduced.

The total probable construction cost estimate for Alternative 6 including extension of the three bridges, a NWP with 15% contingency, and 20% engineering and surveying is approximately $8,600,000. Replacement on the bridges in lieu of extension could result in a total probable construction cost of $32,590,000. Details of cost estimation are provided in Appendix I.

Benefit
The benefits of Alternative 6 include significant reduction (up to 2.5 feet) of Mountain Creek flood WSELs and floodplains in the Intermediate Roadway and Thompson's Branch Areas. Additionally, approximately 400,000 CY of cut generated by channel improvements could be used to raise adjacent properties while preserving regional valley storage. It should be noted, however, that the decrease in WSELs results in limited removal of property from the floodplain due to the wide, flat nature of the existing floodplain.

5.0 PHASING AND IMPLEMENTATION

5.1 PRIORITIZATION OF ALTERNATIVES

The viability of alternatives is typically measured through a comparison of the relative costs and benefits; however, the alternatives identified for flood mitigation in the lower Mountain Creek watershed offer varying levels of protection and have costs that require further investigation to quantify. Therefore, a direct cost-benefit analysis may not be the most useful method for prioritizing the alternatives. The following paragraphs discuss the relative costs and benefits of the alternatives and identify the most effective alternatives for both improving local drainage and attenuating Mountain Creek flood flows.

Improving Local Drainage

While Alternatives 1, 2, and 3 (corollary) offer extremely limited reduction of flooding due to Mountain Creek, they provide improved conveyance of local drainage, including flows from Thompson's Branch. These alternatives also involve many options and degrees of participation, which may offer some flexibility to the implementation process and allow many phasing scenarios. Based on the minimum cost of construction to establish conveyance of local drainage to Mountain Creek, Alternative 2 (without buy-out/excavation of the mobile home park or improvements to the west channel upstream of Jefferson Street) is the most cost effective and beneficial local drainage alternative.

Implementation of this minimized alternative would involve the construction of a new 1,350-foot channel and dedication of an approximate 5.3-acre easement along the western property boundary of the drag racing facility and the improvement of the eastbound Jefferson Street culvert system. Implementation, including Nationwide Permitting, 15% contingency, and 20% engineering and surveying is approximately $1,250,000.

Mountain Creek Flood Attenuation

Alternatives 4A, 4B, and 4C, which involve the addition of flood storage upstream of Mountain Creek Lake Dam, are the only alternatives that would reduce Mountain Creek flood flows in the study area. Since Alternative 4A requires no construction cost and potentially no easement cost, and offers enough additional storage to potentially reduce the 100-year flow to approximate the 25-year flow in the lower watershed, it should be further investigated to determine viability and extent of associated impacts to dam safety and power plant operations.

Implementation of this alternative would involve the modification of Mountain Creek Lake operating procedures in coordination with the City of Grand Prairie, Exelon, and other adjacent property owners. Since the lake would be allowed to rise up to four feet during extreme flood events, easements may be required along the lake perimeter. However, the cost of easement acquisition is potentially insignificant compared to the construction costs of Alternatives 4B and 4C. Geotechnical investigations of dam integrity should be included in any dam safety analysis for further consideration of this option. If the currently unknown impacts to the dam, adjacent properties, and power plant operations can be determined and adequately addressed, this option provides the greatest potential benefit to downstream properties.

5.2 POTENTIAL FUNDING SOURCES

An important aspect of implementing any of the recommended alternatives is the funding mechanism. The summary below provides a description of the potential available funding sources for the City to construct a project.

Municipal Funding Sources

Capital Improvements Plan (CIP) - a long-range plan, usually four to six years, which identifies capital projects and equipment purchases, provides a planning schedule and identifies options for financing the plan.

Drainage Utility Fees - Municipal stormwater projects are funded by the assessment of a drainage utility fee for all developed projects based on amount of impervious cover, number of living units, or site area.

Regional Storm Water Program Impact Fee - The 1% annual chance flood volume difference at MCL Dam between existing and ultimate conditions is approximately 889 ac-ft, which accounts for a 3% flood volume increase. While storage would be required for this volume increase, the additional storage provided by implementation of Alternatives 4 could potentially offset storage requirements for future upstream development. Since the recommended alternative is intended to reduce downstream flooding by storage of up to 9,580 ac-ft, the addition of 889 ac-ft of storage to account for ultimate conditions could be attained relatively easily. An impact fee could be established to pass the cost of alternative implementation to upstream developers who would benefit from reduced detention requirements. Since the reduction of detention requirements would require the modification of local drainage and development policies, further investigation is required to quantify this potential funding source.

General Fund – The primary operating fund of a governmental entity.

General Obligation Bond (GO) - A municipal bond that is backed by the credit and "taxing power" of the issuing jurisdiction, rather than the revenue from a given project. General obligation bonds are issued with the belief that a municipality will be able to repay its debt obligation through taxation or revenue from projects. No assets are used as collateral. These bonds are typically considered the most secure type of municipal bond, and therefore carry the lowest interest rate.

Revenue Bond - A municipal bond supported by a specified stream of future income, such as income generated by a water utility from payments by customers. This differs from general-obligation bonds, which can be repaid through a variety of tax sources. Revenue bonds are only payable from specified revenues. A main reason for using revenue bonds is that they allow the municipality to avoid reaching legislated debt limits.

Special Assessment Bond - A special type of municipal bond used to fund a development project based on property tax assessments of properties located within the issuer's boundaries.

Tax Increment Bond - A bond (also known as a “tax allocation bond”) payable from the incremental increase in tax revenues realized from any increase in property value resulting from capital improvements benefiting the properties that are financed with bond proceeds. Tax increment bonds often are used to finance the redevelopment of blighted areas.

State Assistance

TRA (Trinity River Authority) - The river authority for the watershed. Many State and Federal agencies stipulate that river authorities must be the arbiters for the pass-through of funds.

TWDB (Texas Water Development Board) - Clean Water State Revolving Fund - Provides perpetual funds to provide low interest loan assistance for the planning, design, and construction of stormwater pollution control projects.

- Research and Planning Fund Grants – The purpose is to provide financial assistance for research and feasibility studies into practical solutions to water-related problems.
- State Participation and Storage Acquisition Program – The purpose is to help finance regional water projects including water storage facilities and flood retention basins; and to allow for “right sizing” of projects in consideration of future growth.
- Texas Water Development Fund – The purpose is to provide loans for the planning, design, and construction of water supply, wastewater, and flood control projects.

TCEQ (Texas Commission on Environmental Quality) - Texas Clean Rivers Program (CRP) – The purpose of these funds are to maintain and improve the quality of surface water resources within each river basin in Texas.

Federal Assistance

FEMA (Federal Emergency Management Agency)

- Flood Hazard Mapping Program – Department of Homeland Security (DHS) funds are administered through FEMA to identify, publish, and update information on all flood-prone areas of the U.S. in order to inform the public on flooding risks, support sound floodplain management, and set flood insurance premium rates.
- Flood Mitigation Assistance Grants (FMA) – The purpose is to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured through the National Flood Insurance Program (NFIP).
- Hazard Mitigation Grant Program (HMGP) – The purpose is to provide states and local governments financial assistance to permanently reduce or eliminate future damages and losses from natural hazards through safer building practices and improving existing structures and supporting infrastructure.
- Pre-Disaster Mitigation Grant Program (PDM) – The purpose is to provide funding for states and communities for cost-effective hazard mitigation activities that complement a

comprehensive hazard mitigation program and reduce injuries, loss of life, and dame and destruction of property.

HUD (U.S. Department of Housing and Urban Development)

- Disaster Relief/ Urgent Needs Fund of Texas - To rebuild viable communities impacted by a natural disaster or urgent, unanticipated needs posing serious threats to health and safety by providing decent housing, suitable living environments and economic opportunities.
- Texas Community Development Program – The purpose is to build viable communities that meet "basic human needs" such as safe and sanitary sewer systems, clean drinking water, disaster relief and urgent needs, housing, drainage and flood control, passable streets, and economic development.

NRCS (Natural Resources Conservation Service)

- Watershed Protection and Flood Prevention Program – To protect, develop, and utilize the land and water resources in small watersheds of 250,000 acres or less. The program is Federally assisted and locally led.
- Watershed Surveys and Planning – Provides planning assistance to Federal, State, and local agencies for the development of coordinated water and related land resources programs in watersheds and river basins. Emphasis on flood damage reduction, erosion control, water conservation, preservation of wetlands, and water quality improvements.
- Wetlands Reserve Program – To protect and restore wetlands by enabling landowners to sell easements which take wetlands out of production.
- Emergency Watershed Protection Program – The purpose is to provide relief from imminent hazards and reduce the threat to life and property in the watersheds damaged by severe natural events. Hazards include floods and the products of erosion created by floods, fire, windstorms, earthquakes, drought, or other natural disasters.

USACE (United States Army Corps of Engineers)

- Emergency Advance Measures for Flood Prevention – The purpose is to protect against the loss of life or damages to property given an immediate threat of unusual flooding.
- Emergency Rehabilitation of Flood Control Works – The purpose of this program is to assist in the repair or restoration of flood control works damaged by flood.
- Emergency Streambank and Shoreline Protection – The purpose is to prevent erosion damages to public facilities by the emergency construction or repair of streambank and shoreline protection works.
- Floodplain Management Services – The purpose is to promote appropriate recognition of flood hazards in land and water use planning and development through the provision of flood and floodplain related data, technical services, and guidance.
- Nonstructural Alternatives to Structural Rehabilitation of Damaged Flood Control Works – This program provides a nonstructural alternative to the structural rehabilitation of flood control works damaged in floods or coastal storms.
- Planning Assistance to States – The purpose is to assist states, local governments and other non-Federal entities in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources.
- Small Flood Control Projects – The purpose is to reduce flood damages through small flood control projects not specifically authorized by Congress.

5.3 REGULATORY COMPLIANCE

Prior to commencement of construction, it will be necessary to submit the project and appropriate permit applications to regulatory agencies. A detailed review and acquisition of the necessary permits for the construction of these projects exceeds the scope of this contract; however, a partial list and brief discussion of permits is included in the following subsections. This following list of agencies and corresponding permit activities is intended to be general in nature and is not intended to represent a definitive list of required permit acquisitions and agency coordination.

Federal Emergency Management Agency (FEMA)

The National Flood Insurance Act of 1968 was enacted by Title XIII of the Housing and Urban Development Act of 1968 (Public Law 90-448, August 1, 1968) to provide previously unavailable flood insurance protection to property owners in flood prone areas. FEMA administers the National Flood Insurance Program (NFIP); however, if a local community elects to participate in the NFIP, the local government is primarily responsible for enforcement. Participating communities are typically covered by a Flood Insurance Study which defines water surface profiles and floodplain boundaries through their communities.

The recommended drainage improvement projects are intended to reduce floodplain limits. If changes to the current effective FEMA floodplain map are desired as a result of improvements, a request for a Letter of Map Revision (LOMR) from FEMA will be required.

U. S. Army Corps of Engineers (USACE)

Pursuant to Section 404 of the Clean Water Act and the Rules and Regulations promulgated there under by the United States Environmental Protection Agency (USEPA) and the United States Army Corps of Engineers (USACE), the filling or excavation of waters of the United States, including wetlands, with dredged or fill material, requires the issuance of a permit from the USACE (33 CFR Parts 320-330). For purposes of administering the Section 404 permit program, the USACE defines wetlands as follows:

> *Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. (33 CFR 328.3)*

The *Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1)*, issued by the USACE in 1987 states that wetlands must possess three essential characteristics. These characteristics include, under normal circumstances: 1) the presence of hydrophytic vegetation, 2) hydric soils, and 3) wetland hydrology. If all three of these criteria are present on a particular property in areas larger than one-third acre in size, then a permit (general permit or nationwide permit) must be issued by the USACE in order to fill all or a portion of those areas. Exhibit 19 in Appendix A shows the known wetland areas within the 100-Year floodplain.

Section 404 (b)(1) guidelines (40 CFR Part 230), established by the USEPA, constitute the substantive environmental criteria used in the evaluating activities regulated under Section 404 of the Clean Water Act. The purpose of these guidelines is to restore and maintain the chemical physical and biological integrity of waters of the United States through the control of discharge of dredged or fill material.

All property owners within the United States and its territories must adhere to the provisions of the Clean Water Act. If any contemplated activity might impact waters of the United States, including adjacent or isolated wetlands a permit application must be made. If jurisdictional waters and/or wetlands are found to exist, then any activity which would involve filling, excavating, or dredging these wetlands would require the issuance of a permit. The final authority to determine whether or not jurisdictional waters exist lies with USACE.

There is a strong likelihood that Waters of the U.S. jurisdictional areas exist along the main stem and secondary channels of Mountain Creek, downstream and upstream of Mountain Creek Lake. It is recommended that the City engage the USACE early in its design process.

U.S. Fish and Wildlife Service (USFWS)

The U.S. Fish and Wildlife Service (USFWS), in the Department of the Interior, and the National Marine Fisheries Service (NMFS), in the Department of Commerce, share responsibility for administration of the Endangered Species Act (ESA). Generally, the USFWS is responsible for terrestrial and freshwater species and migratory birds, while the NMFS deals with those species occurring in marine environments and anadromous fish.

Section 9 of the ESA prohibits take of federally listed endangered or threatened species without appropriate authorization. Take is defined in the ESA, in part as “killing, harming, or harassment” of a federally listed species, while incidental take is take that is “incidental to, and not the purpose of, otherwise lawful activities”.

Section 10 of the ESA provides a means for non-Federal projects resulting in take of listed species to be permitted subject to carefully prescribed conditions. Application for an incidental take permit is subject to a number of requirements, including preparation of a Habitat Conservation Plan by the applicant. In processing an incidental take permit application, the USFWS must comply with appropriate environmental laws, including the National Environmental Policy Act. Review of the application under Section 7 of the ESA is also required to ensure that permit issuance is not likely to jeopardize listed species. Section 10 issuance criteria require the USFWS to issue and incidental take permit if, after opportunity for public comment, it finds that:

1. the taking will be incidental;
2. the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the taking;
3. the applicant will ensure that adequate funding and means to deal with unforeseen circumstances will be provided;

4. the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and
5. the applicant will ensure that other measures that the USFWS may require as being necessary or appropriate will be provided.

The U.S. Fish and Wildlife Service should be contacted to determine the potential occurrence of and consequent impacts to any federal threatened and endangered species. In addition, the Corps of Engineers will require USFWS review of the project to ensure the project is in compliance with the Endangered Species Act prior to the issuance of a Section 404 permit.

Texas Commission on Environmental Quality (TCEQ)

The Texas Commission on Environmental Quality (TCEQ) has regulatory authority over: dam safety, the Edwards Aquifer, water rights, Texas Pollutant Discharge Elimination System and Section 404(b)(1) guidelines for specification of disposal sites for dredged or fill material. The following sections briefly describe these regulations.

- Texas Pollutant Discharge Elimination System (TPDES)

On September 14, 1998, the USEPA authorized Texas to implement its Texas Pollutant Discharge Elimination System (TPDES) program. TPDES is the state program to carry out the National Pollutant Discharge Elimination System (NPDES), a federal regulatory program to control discharges of pollutants to surface waters of the United States. The TCEQ administers the program, and a permit is required for any construction activity that disturbs one acre or more.

- Section 401 Water Quality Certification

Any activity requiring authorization under Section 404 of the Clean Water Act will also require a Section 401 water quality certification from the TCEQ. In Texas, these regulations are administered by the TCEQ.

- Texas Water Code Section 11.121 Water Right Permit

Use of surface water, including the diversion or storage of water, in the State of Texas requires a water right permit through the State of Texas pursuant to Texas Water Code Section 11.121. TCEQ requires the submission of the Water Rights Permit Package Application, TCEQ-10214 form. This application must be notarized and submitted with the water use permit application fees. Supplemental information may be required with the application.

Texas Historical Commission

The Division of Antiquities Protection of the Texas Historical Commission coordinates the program by identifying and protecting important archeological and historic sites that may be threatened by public construction projects. This department coordinates the nomination of numerous sites as State Archeological Landmarks or for listing in the *National Register of Historic Places*. Designation is often sought by interested parties as the most effective way to protect archeological sites threatened by new development or vandalism. Applicable rules are found in the Texas Administrative Code, Title 13-Cultural Resources, Part II-Texas Historical Commission, Chapters 24-28.

The Corps of Engineers will require that the State Historical Preservation Officer (SHPO) review the project to ensure the project is in compliance with the National Historic Act prior to issuance of a Section 404 permit.

Corridor Development Certificate

The North Central Texas Council of Governments (NCTCOG), in coordination with USACE, has initiated the Corridor Development Certificate (CDC) permitting process as part of the Trinity River Corridor floodplain management program. The CDC process aims to stabilize flood risk along the Trinity River. The CDC process does not prohibit floodplain development, but ensures that any development that does occur in the floodplain will not raise flood water levels or reduce flood storage capacity.

Under the CDC process, local governments retain ultimate control over floodplain permitting decisions, but other communities along the Trinity River Corridor are given the opportunity to review and comment on projects in their neighbor's jurisdiction. As the Metroplex economy continues to grow and develop, the CDC process is intended to prevent increased flood risks.

Under the CDC process, a CDC permit is required to develop land within a specific area of the Trinity River Basin floodplain called the Regulatory Zone, which is similar to the 100-year floodplain. The regulatory zone includes some adjacent tributary floodplain areas where these areas are subject to backwater flooding by the Trinity River. The entire Mountain Creek floodplain downstream of MCL dam is included in the CDC Regulatory Zone. A development activity is defined as "any manmade change to improved or unimproved real estate, including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, or excavation." To ensure consistency with TCEQ requirements, development activity also includes "any levee or other improvement."

A CDC permit will most likely be required for implementation of the recommended alternatives. While the City of Grand Prairie retains ultimate control over floodplain permitting, it is recommended that the City initiate the CDC permitting process early in the design phase of the project.

5.4 ENVIRONMENTAL CONSTRAINTS

5.4.1 Auto Salvage Yards

The area delineated by the 100-year floodplain just north of Mountain Creek Lake in Grand Prairie, Texas contains approximately 390 acres of land devoted to the industrial activity of auto salvage. So that pollutants are not discharged via stormwater runoff to nearby waterways, the fluids related to cars and auto salvage yards must be handled, stored, and disposed of properly. These fluid contaminants include anti-freeze, aqueous cleaners, brake fluid, fuel, refrigerants, solvents, oil, and window washing fluid. The material type, chemical and physical description, and the specific regulated stormwater pollutants associated with each material are outlined in Table 16 below.

Table 16: Materials Common to Auto Salvage Yards

Trade Name Material	Chemical/Physical Description	Storm Water Pollutants
Lubricants	Black/brown oily liquid hydrocarbon	Oil & grease, lead, cadmium
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil
Brake Fluid	Ethylene glycol based syrupy liquid	Ethylene glycol
Antifreeze/coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)
Windshield washer fluid	Clear or blue liquid	Ammonia, methanol
Oil recovered from steam cleaning	Brown oily water	Oil & grease, solids
Wastewater recovered from steam cleaning	Water	Oil & grease, solids
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE
Battery acid	White translucent liquid or gel	Sulfuric acid
Transmission Fluid	Red liquid	Mineral oil, glycols, heavy metals, petroleum distillates
Degreasing Solvents	Colorless or white liquid	Trichloroethylene, trichloroethane, perchloroethylene
Motor oil	Clear, amber liquid petroleum hydrocarbon	Mineral oil, petroleum distillates
Diesel Fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes
Car batteries	Clear, slightly yellow liquid	Lead sulfate
Rust	Reddish solid	Iron oxides
Switches	Viscous silver metallic liquid	Mercury

Source: TCEQ

A common auto salvage yard site consists of a storage area for automobiles, a disassembly area for removal of auto parts, a scrap yard for non-recoverable parts, and an office building. Stormwater from these areas can be potentially contaminated by automobile fluids leaking on the gravel surface, residual oil and grease remaining on parts, and rusting steel. Activities from auto salvage yards that tend to generate pollutants include dismantling/ crushing vehicles, drainage and transfer of vehicle fluids, maintaining vehicles and equipment, and storing fluids, used parts, and scraps. Recommended Best Management Practices (BMPs) for reducing the amount of pollutants associated with auto salvage in stormwater discharges include:

- Removal of all fluids from vehicles before being crushed/ dismantled.
- Inspect scrap yard weekly for evidence of leaks.

- Drain fluids in an area where spills can be easily contained, such as inside a building or on a sealed concrete surface.
- Immediately clean up detected leaks using a dry absorbent.
- Place drip pans under any detected leaks.
- Place absorbent oil socks on storm sewer inlets as a secondary preventative measure to collect fluids from any undetected leaks.
- Installation of a sand filtration system or an in-ground oil-water separator to collect settleable solids and floating oil.
- Reduce significant exposure of service areas to stormwater and stormwater runoff.
- Mitigate water pollution problems caused by ponding or poor drainage by regrading and/ or providing drainage systems designed for the runoff from a 2.0 inch, one-hour storm event.

Soil composition is another factor affecting stormwater pollutant discharge resulting from auto salvage activities. The soil in the area is Ovan Clay with a hydrologic rating of D. The USDA Natural Resources Conservation Service states that soils in this category have a very slow infiltration rate when thoroughly wet. This translates to a high runoff potential for stormwater in the 100-year floodplain further increasing the amount of pollutant discharge directly into Mountain Creek.

5.4.2 Rare, Threatened and Endangered Species

In addition, plant and animal habitats must be carefully considered. The following is a list of the species considered to be rare, threatened, or endangered in Dallas County.

Table 17: Rare, Threatened, and Endangered Species of Dallas County

Taxon	Common Name	Scientific Name	Federal Status	State Status
Birds	Henslow's Sparrow	Ammodramus henslowii		
Birds	Western Burrowing Owl	Athene cunicularia hypugaea		
Birds	Piping Plover	Charadrius melodus	LT	T
Birds	Golden-cheeked Warbler	Dendroica chrysoparia	LE	E
Birds	Peregrine Falcon	Falco peregrinus	DL	E T
Birds	American Peregrine Falcon	Falco peregrinus anatum	DL	E
Birds	Arctic Peregrine Falcon	Falco peregrinus tundrius	DL	T
Birds	Whooping Crane	Grus americana	LE	E
Birds	Bald Eagle	Haliaeetus leucocephalus	LT-PDL	T
Birds	Wood Stork	Mycteria americana		T
Birds	White-faced Ibis	Plegadis chihi		T
Birds	Interior Least Tern	Sterna antillarum athalassos	LE	E
Birds	Black-capped Vireo	Vireo atricapilla	LE	E
Insects	Black Lordithon rove beetle	Lordithon niger		
Mammals	Cave myotis bat	Myotis velifer		

Taxon	Common Name	Scientific Name	Federal Status	State Status
Mammals	Plains spotted skunk	Spilogale putorius interrupta		
Mollusks	Rock pocketbook	Arcidens confragosus		
Mollusks	Wabash pigtoe	Fusconaia flava		
Mollusks	Sandbank pocketbook	Lampsilis satura		
Mollusks	Louisiana pigtoe	Pleurobema riddellii		
Mollusks	Texas heelsplitter	Potamilus amphichaenus		
Mollusks	Pistolgrip	Tritogonia verrucosa		
Mollusks	Fawnsfoot	Truncilla donaciformis		
Mollusks	Little spectaclecase	Villosa lienosa		
Plants	Warnock's coral-root	Hexalectris warnockii		
Plants	Glen Rose yucca	Yucca necopina		
Reptiles	Timber/Canebrake rattlesnake	Crotalus horridus		T
Reptiles	Alligator snapping turtle	Macrochelys temminckii		T
Reptiles	Texas horned lizard	Phrynosoma cornutum		T
Reptiles	Texas garter snake	Thamnophis sirtalis annectens		

Source: Texas Parks and Wildlife

5.5 IMPLEMENTATION

The alternatives discussed in this report were found to have limited beneficial impacts to the Mountain Creek floodplain. Many of the proposed improvements only provide localized benefits by decreasing prolonged flooding after storm events. No single alternative presents itself as a clear project to pursue, and consequently the City should evaluate and assess the cost and effectiveness of any selected alternative and prioritize it for funding against other needs of the City. In addition, further action on these items should be coordinated with the recommendations of the Flood Warning System Feasibility Study completed in September of 2007. If outside funding is required to justify implementation of a project, additional study may be needed to more fully quantify project costs in order to show a positive benefit to cost ratio, as required by most funding sources.

6.0 REFERENCES

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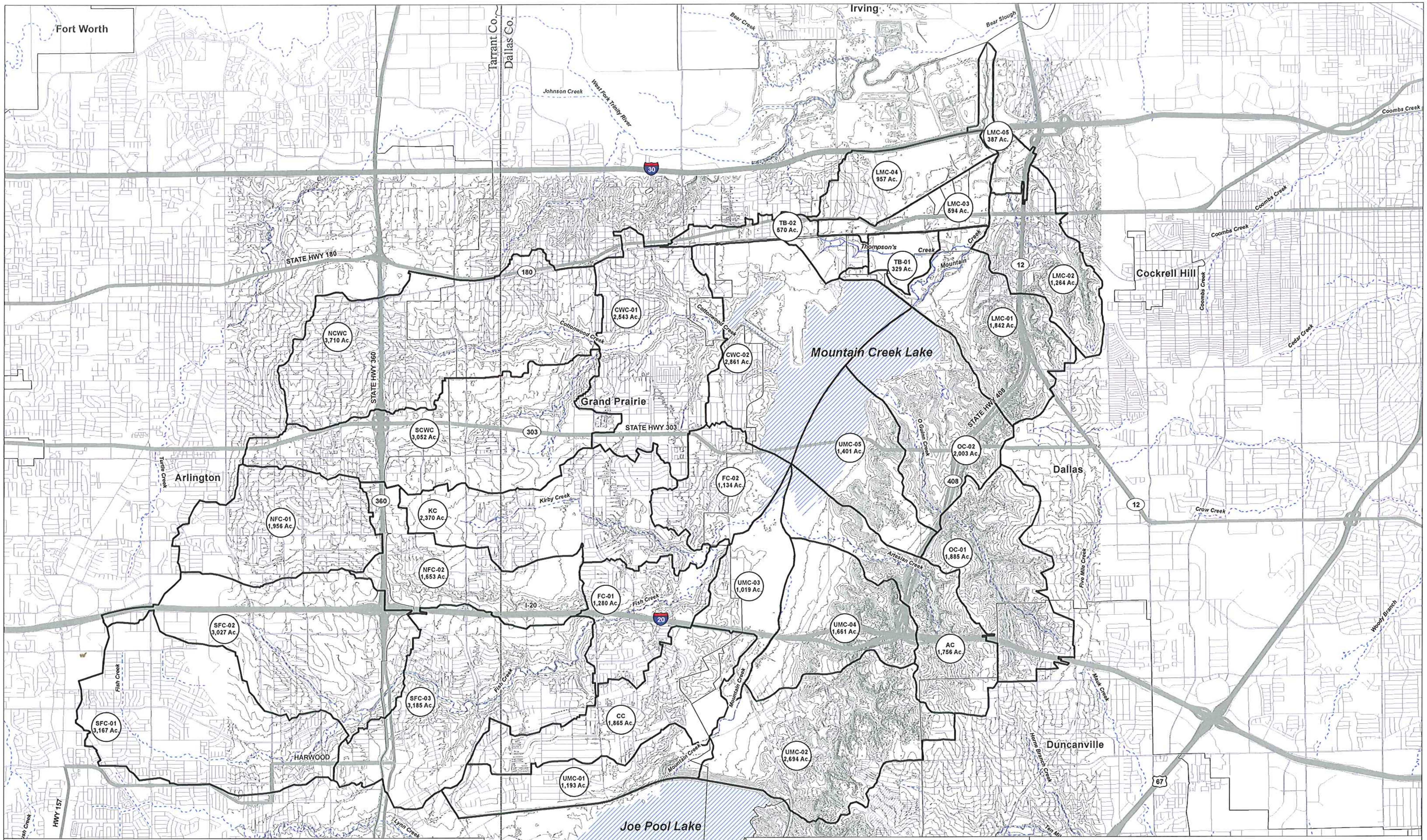
APPENDIX A
EXHIBITS



SUBBASIN BOUNDARY

CITY BOUNDARY

COUNTY BOUNDARY

STREAM (OTHER)

STUDIED STREAM

0 3,000 6,000 12,000

Feet

Espey Consultants, Inc.

Environmental & Engineering Services

EXHIBIT #1

DRAINAGE AREA MAP

MOUNTAIN CREEK FLOOD PROTECTION PLAN

GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

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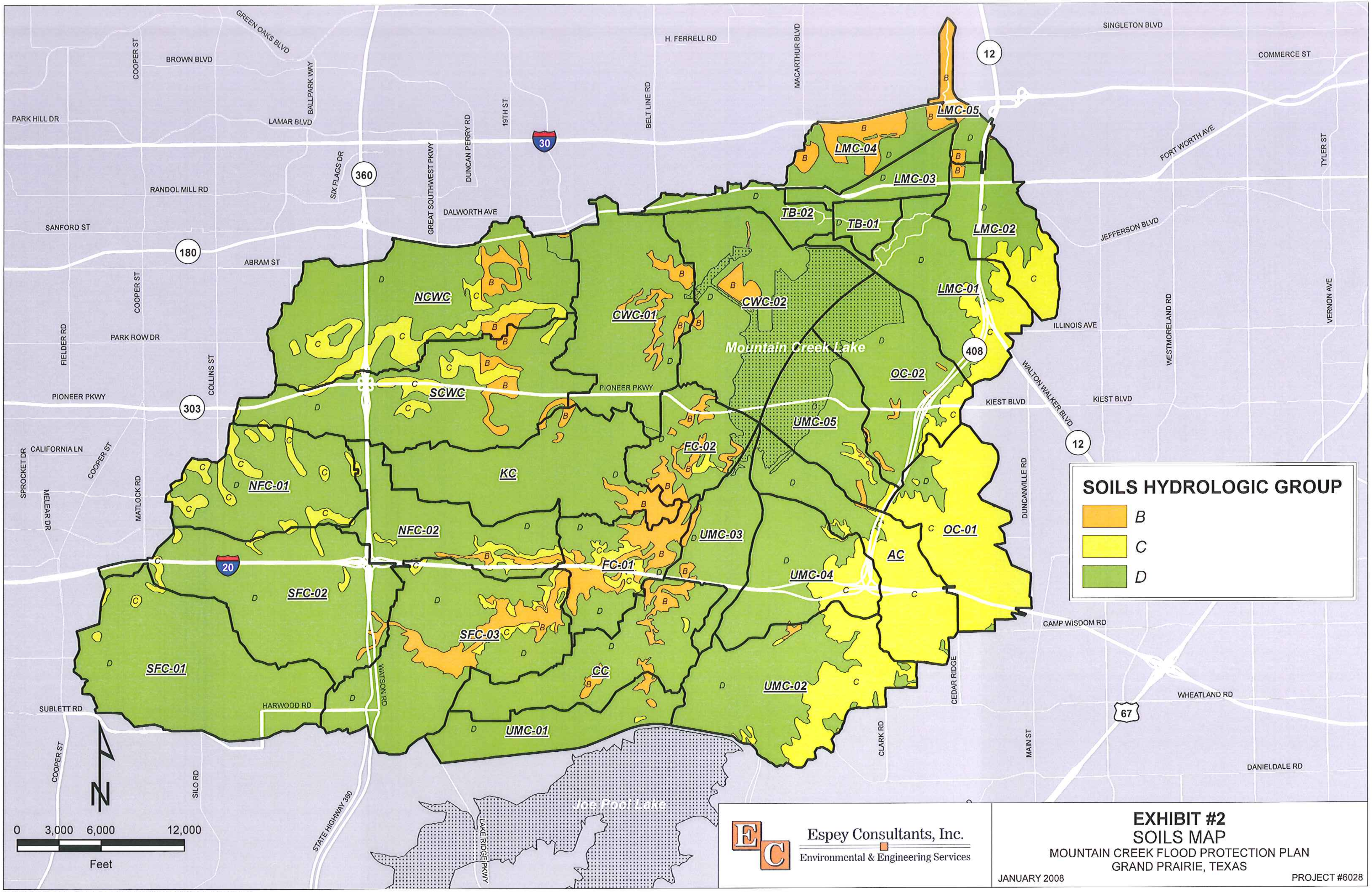

EXHIBIT #2
SOILS MAP
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS
JANUARY 2008
PROJECT #6028

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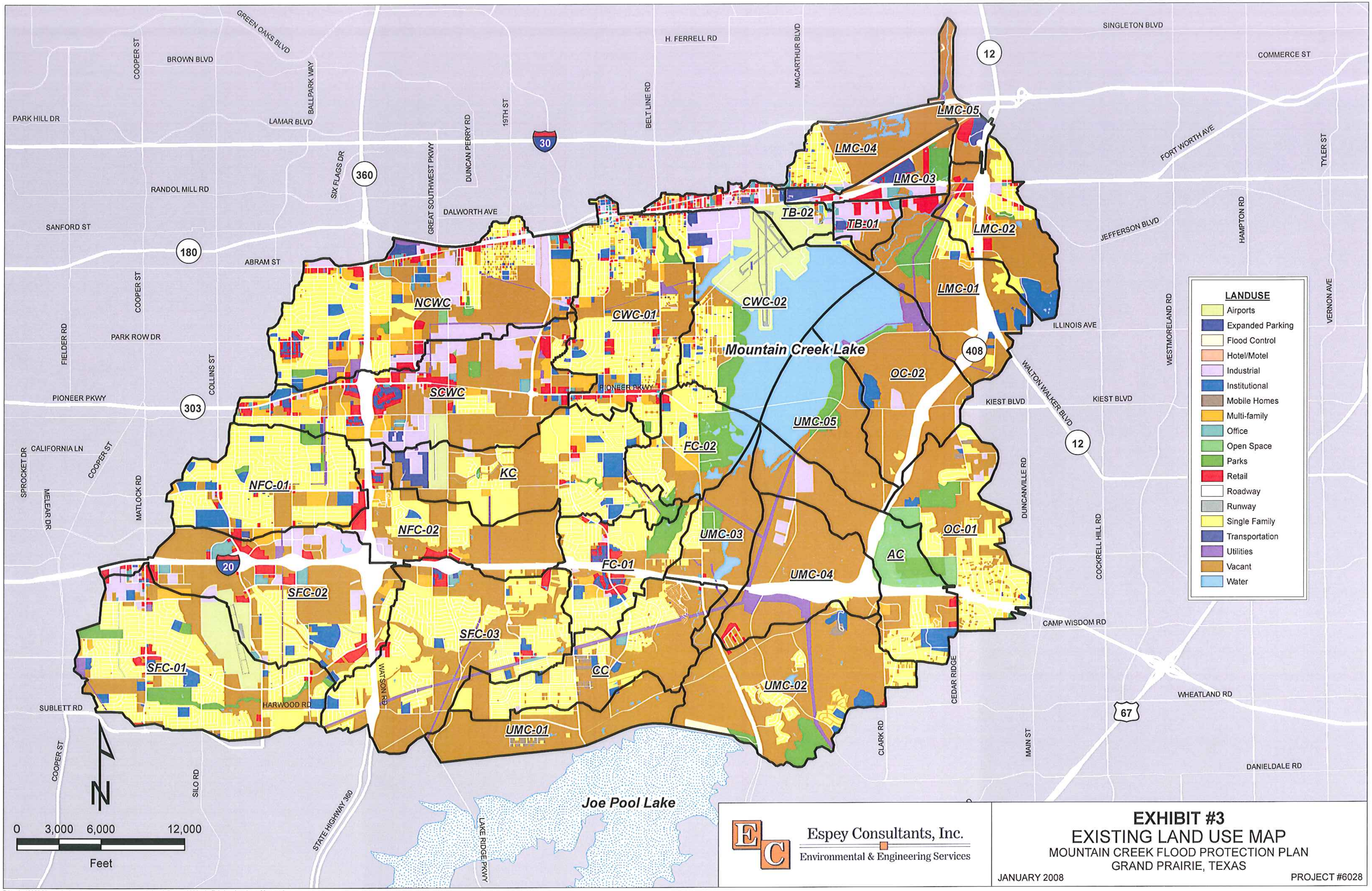

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #3
EXISTING LAND USE MAP
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

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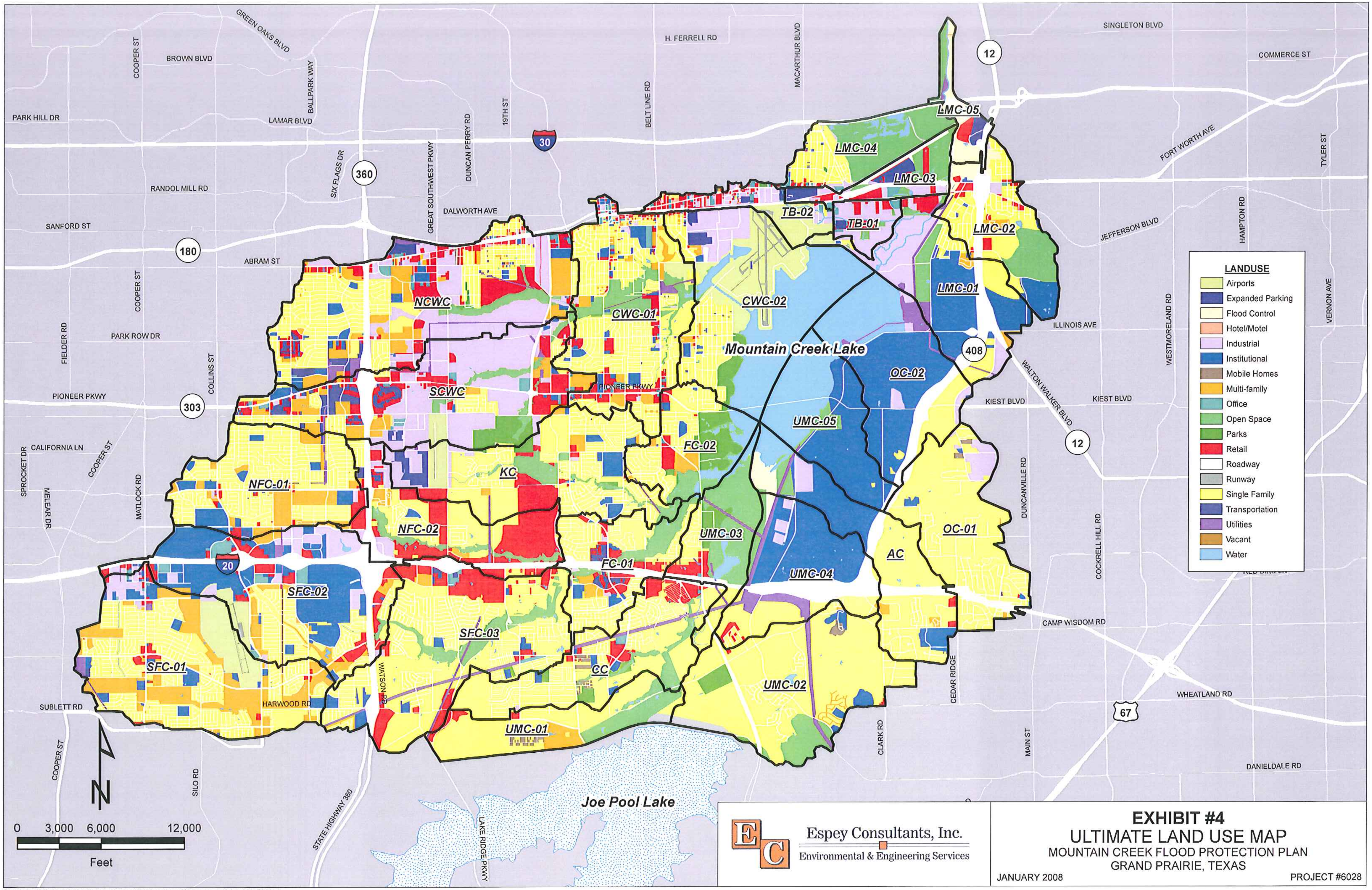

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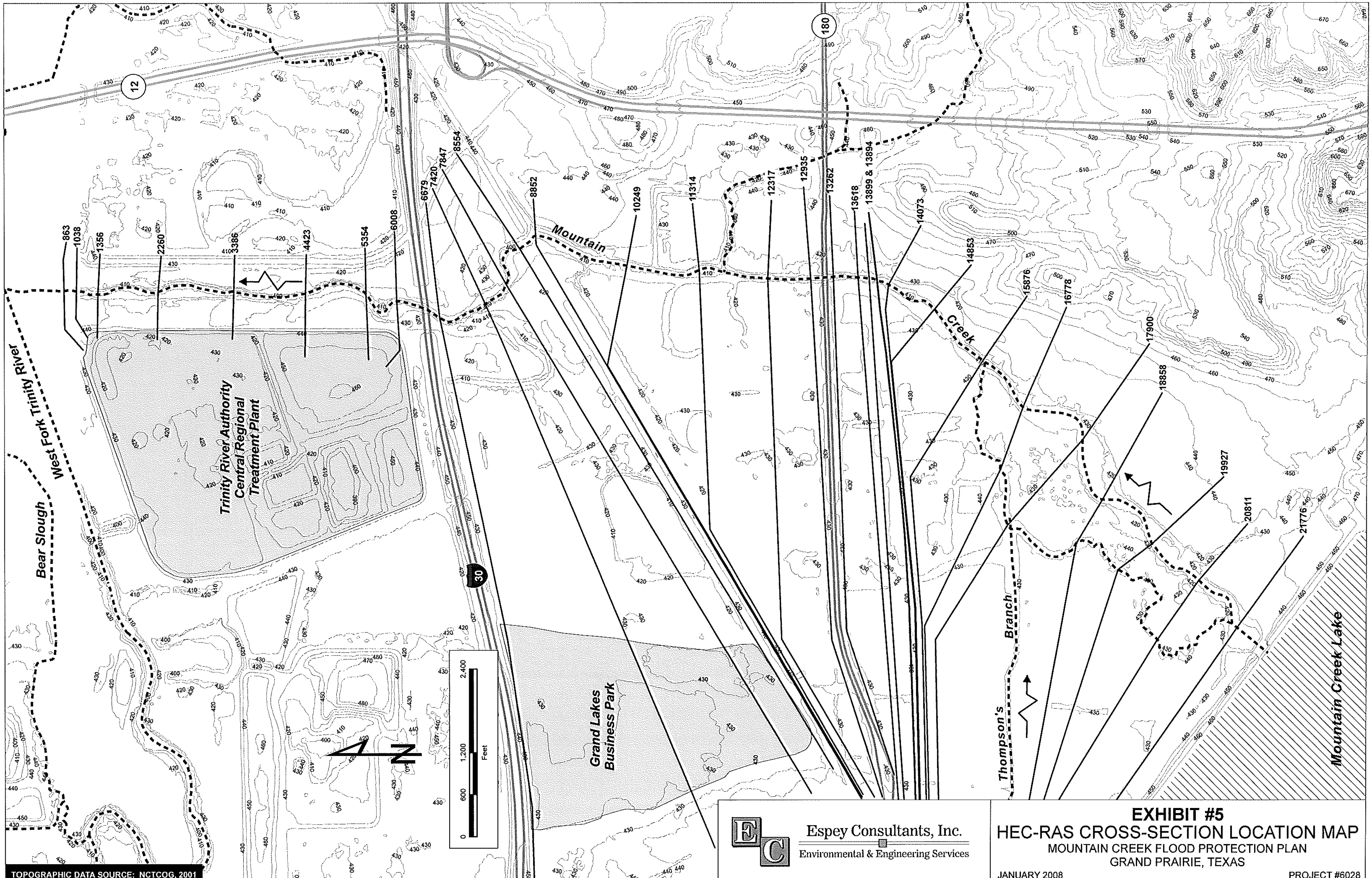

TOPOGRAPHIC DATA SOURCE: NCTCOG, 2001

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #5
HEC-RAS CROSS-SECTION LOCATION MAP
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

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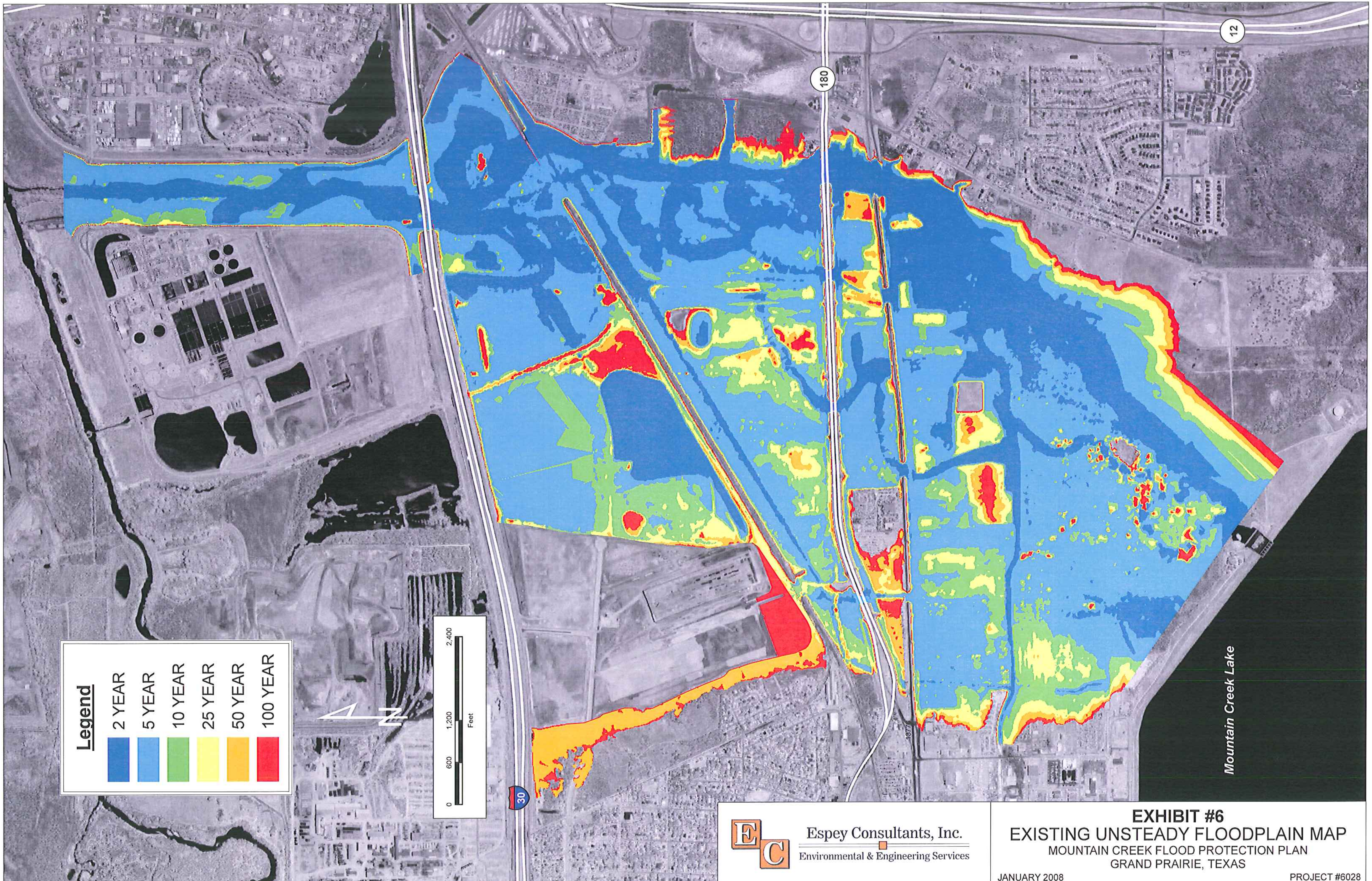

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #6
EXISTING UNSTEADY FLOODPLAIN MAP
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

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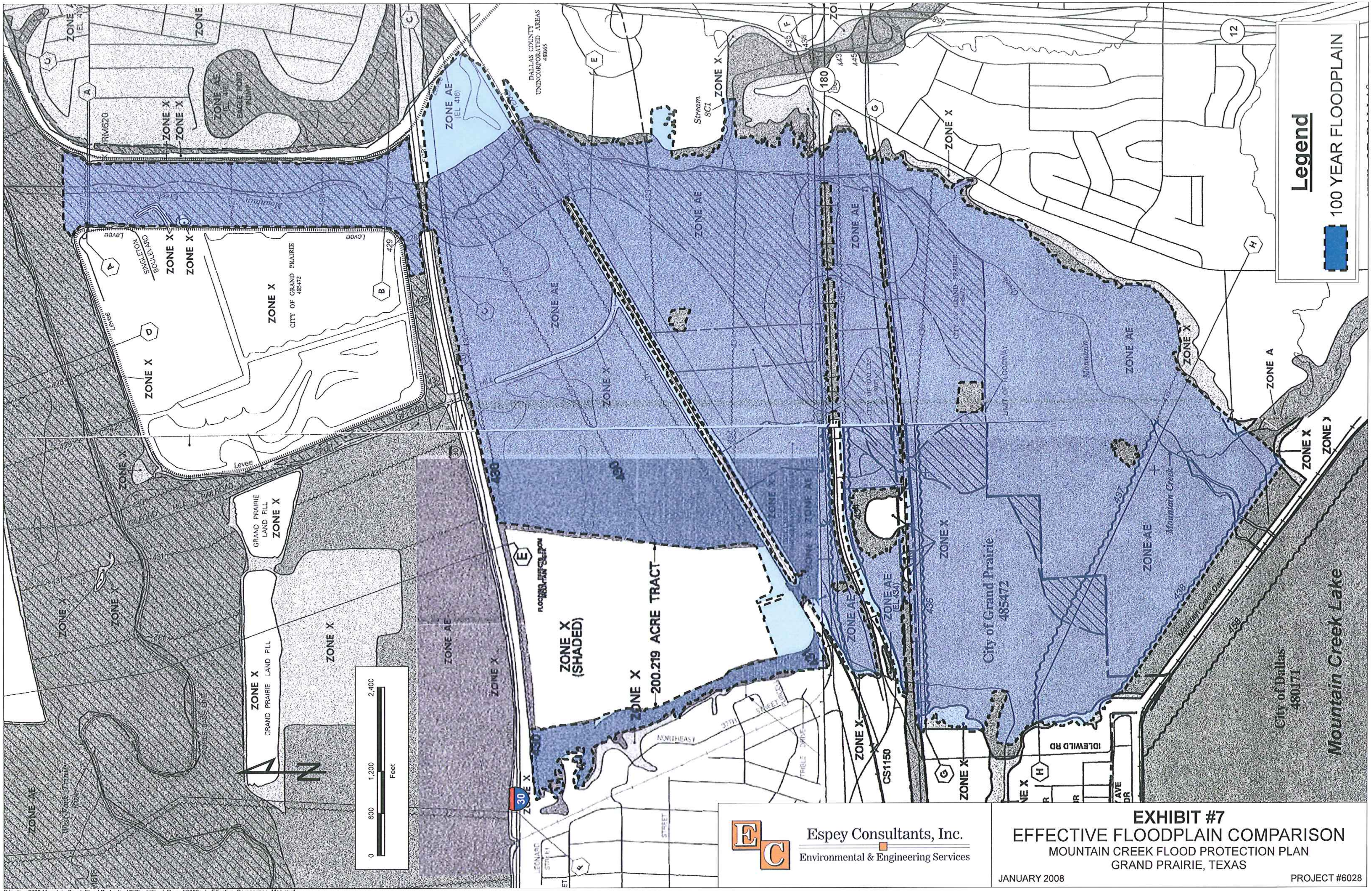

EXHIBIT #7

EFFECTIVE FLOODPLAIN COMPARISON

MOUNTAIN CREEK FLOOD PROTECTION PLAN

GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

Espey Consultants, Inc.

Environmental & Engineering Services

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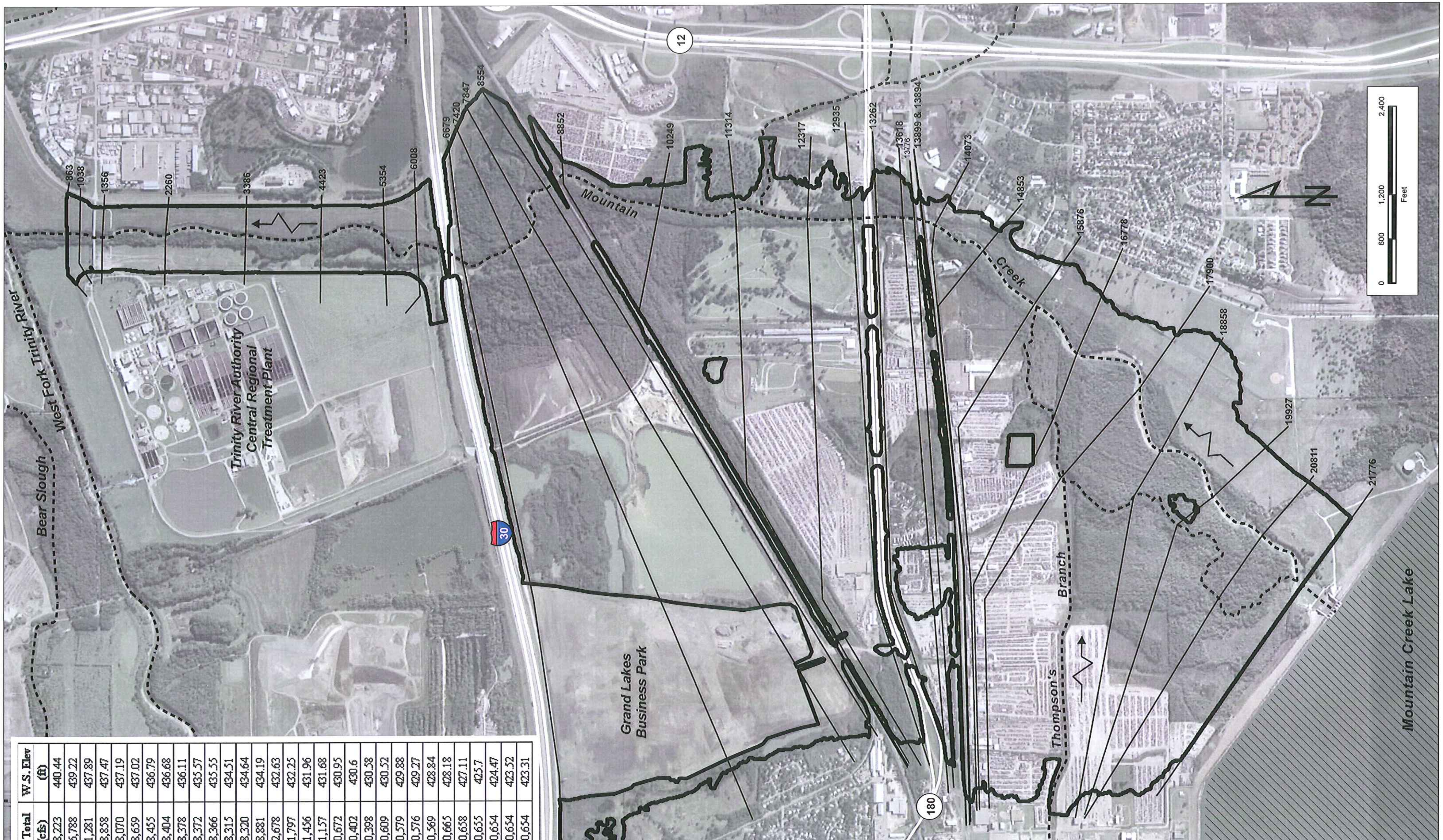

River Station	Q Total (cfs)	W.S. Elev (ft)
21776	58,223	440.44
20811	56,788	439.22
19927	51,281	437.89
18858	48,858	437.47
17900	48,070	437.19
16778	48,659	437.02
15876	48,455	436.79
14853	48,404	436.68
14073	48,378	436.11
13899	48,372	435.57
13894	48,366	435.55
13776	48,315	434.51
13618	48,320	434.64
13262	48,881	434.19
12935	42,678	432.63
12317	41,797	432.25
11314	41,456	431.96
10249	41,157	431.68
8852	40,672	430.95
8554	40,402	430.6
7847	40,398	430.58
7420	40,609	430.52
6679	40,579	429.88
6008	40,576	429.27
5354	40,569	428.84
4423	40,665	428.18
3386	40,658	427.11
2260	40,655	425.7
1356	40,654	424.47
1038	40,654	423.52
863	40,654	423.31

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #8
EXISTING UNSTEADY 100-YR FLOODPLAIN
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

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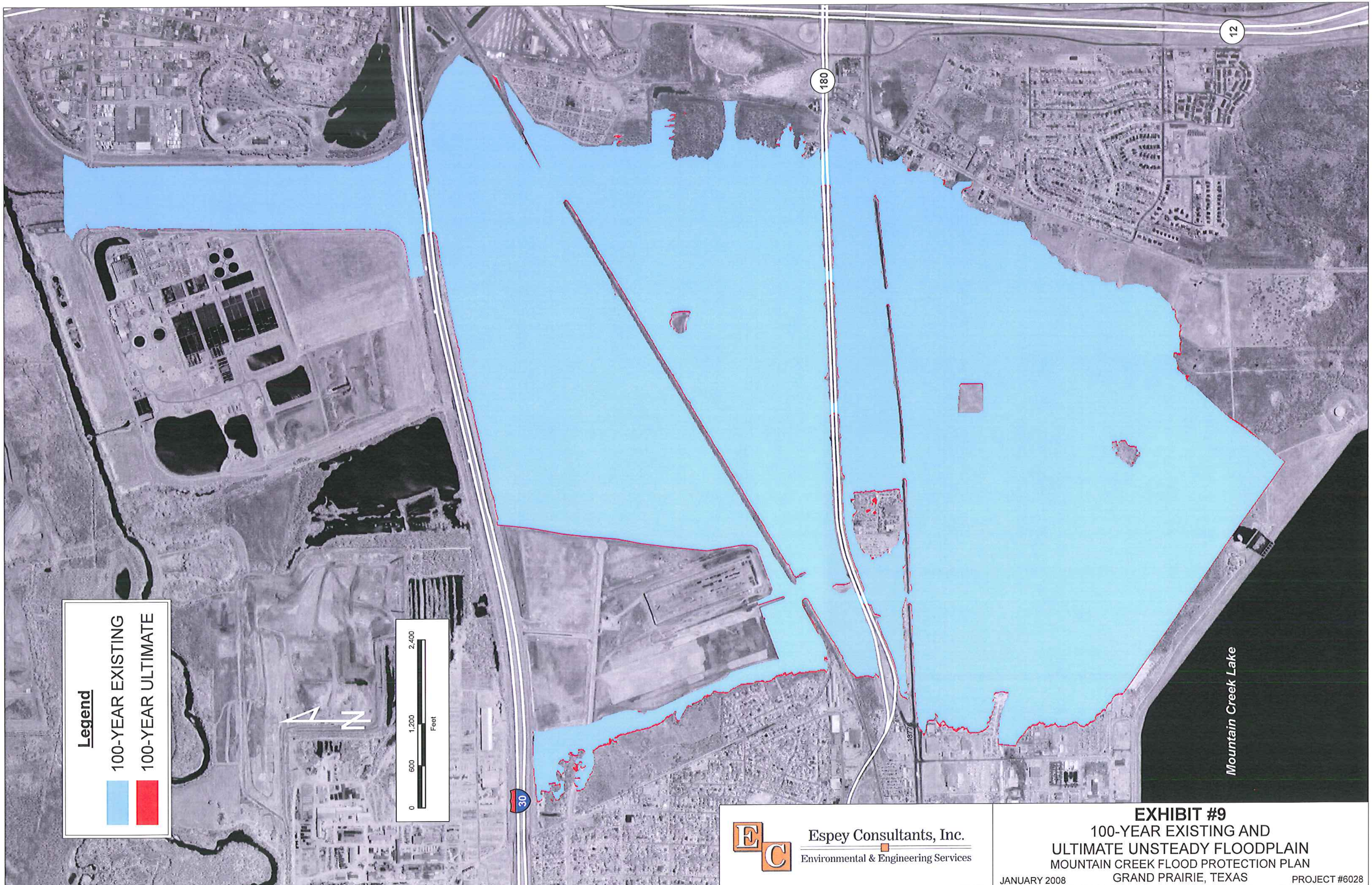

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #9
100-YEAR EXISTING AND
ULTIMATE UNSTEADY FLOODPLAIN
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

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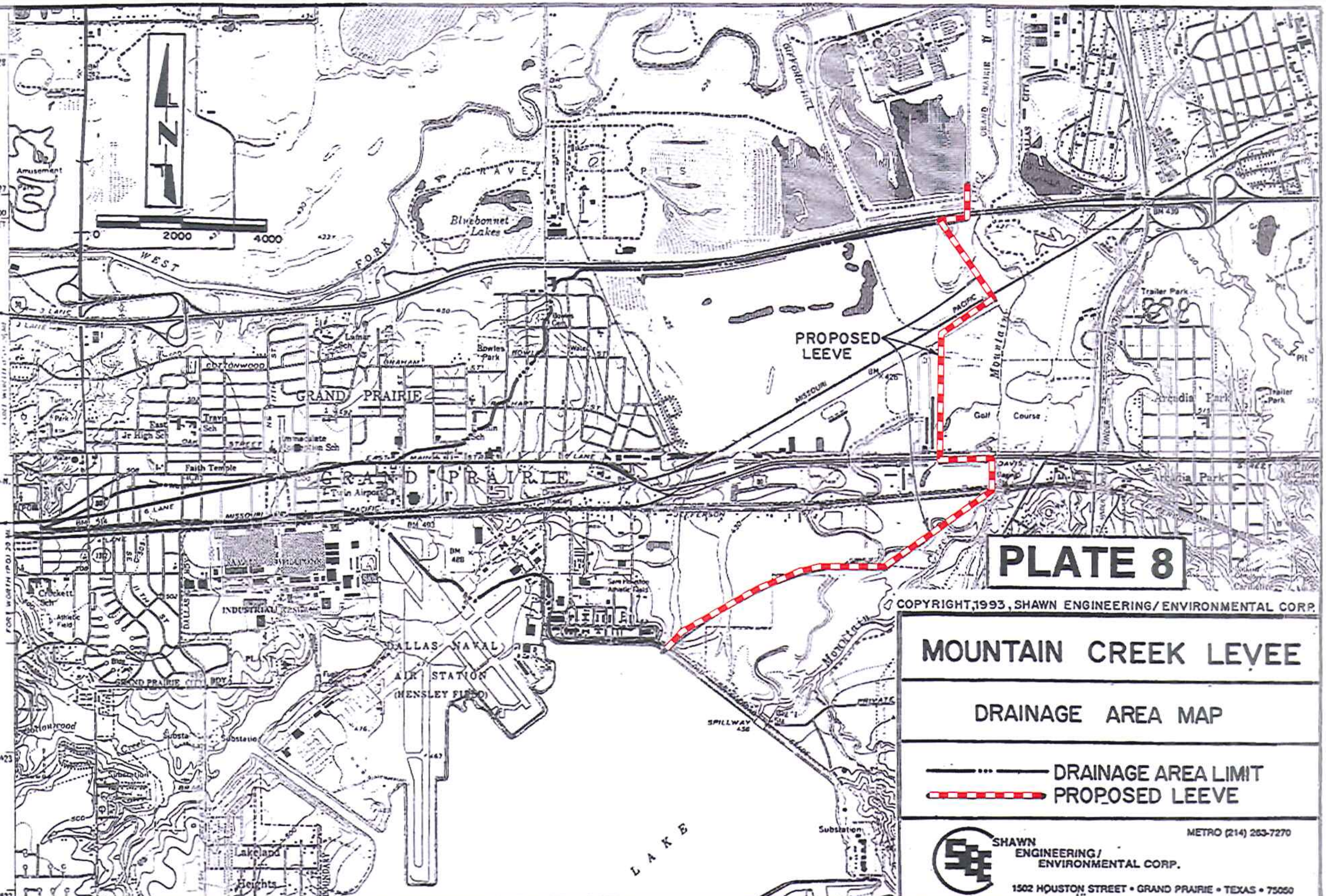

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #10
USACE LEVEE ALTERNATIVE
MOUNTAIN CREEK
GRAND PRAIRIE, TX

JANUARY 2008

PROJECT #6028

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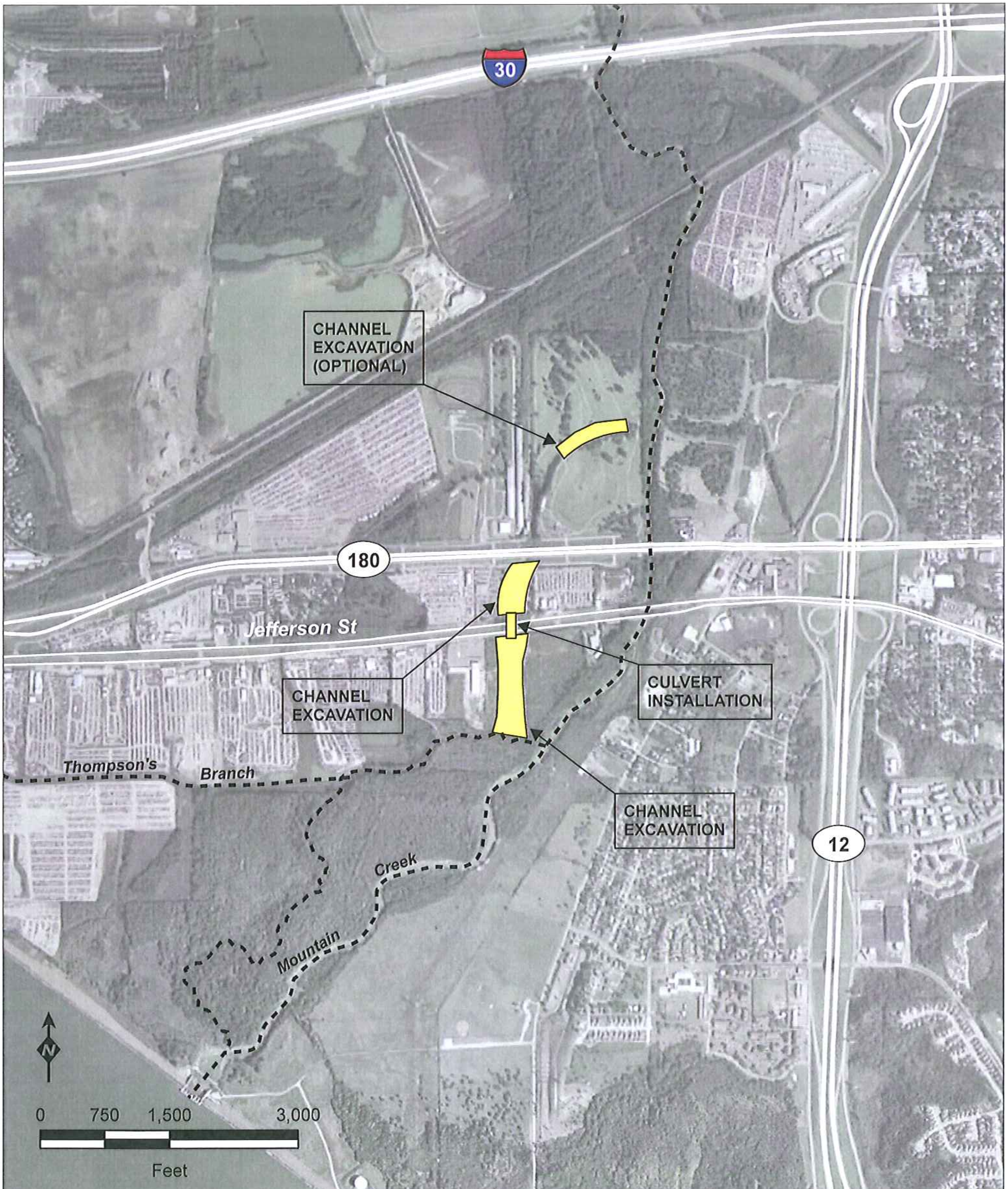

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #11
ALTERNATIVE 1
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

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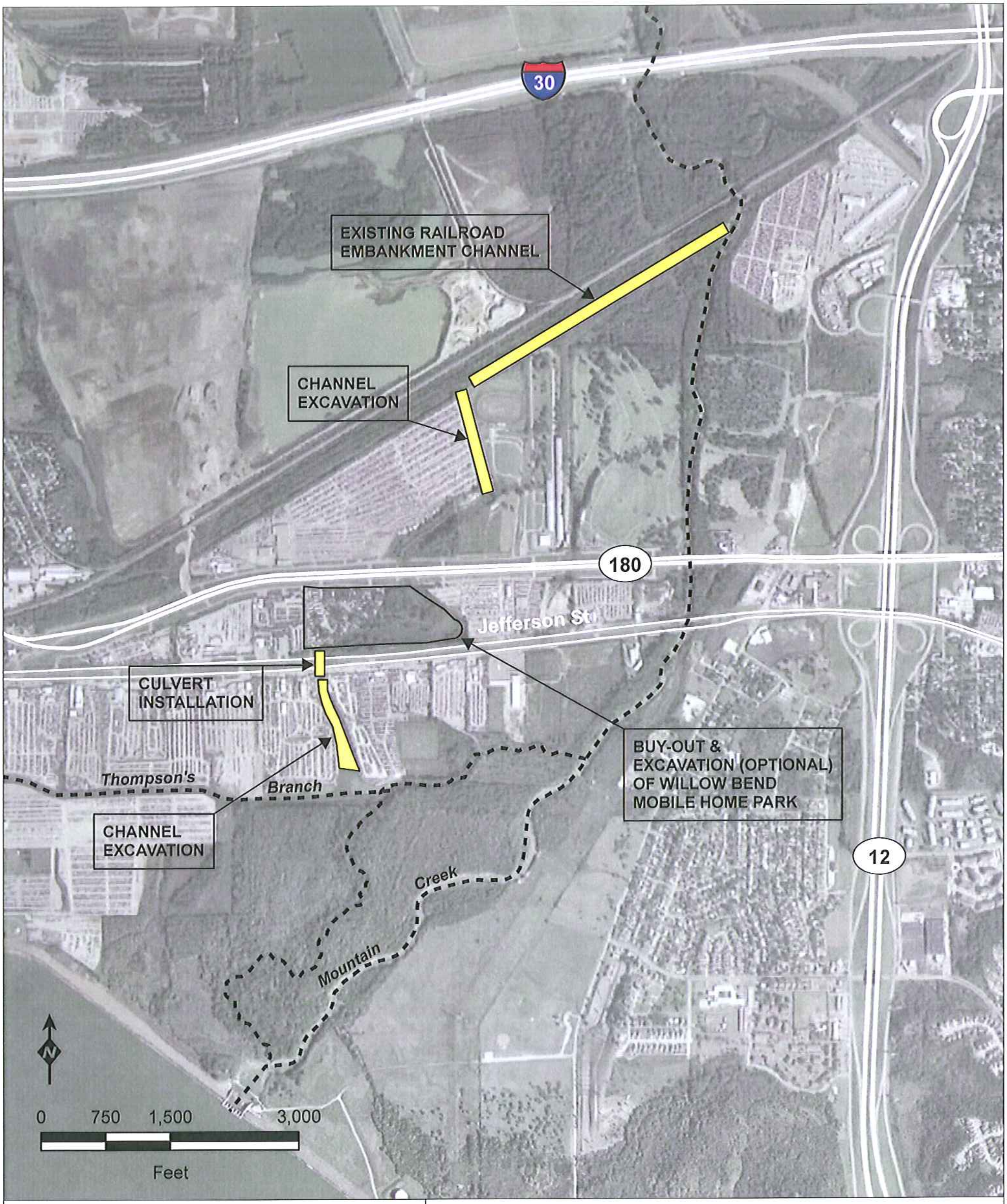

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #12
ALTERNATIVE 2
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

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Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #13
ALTERNATIVE 3
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

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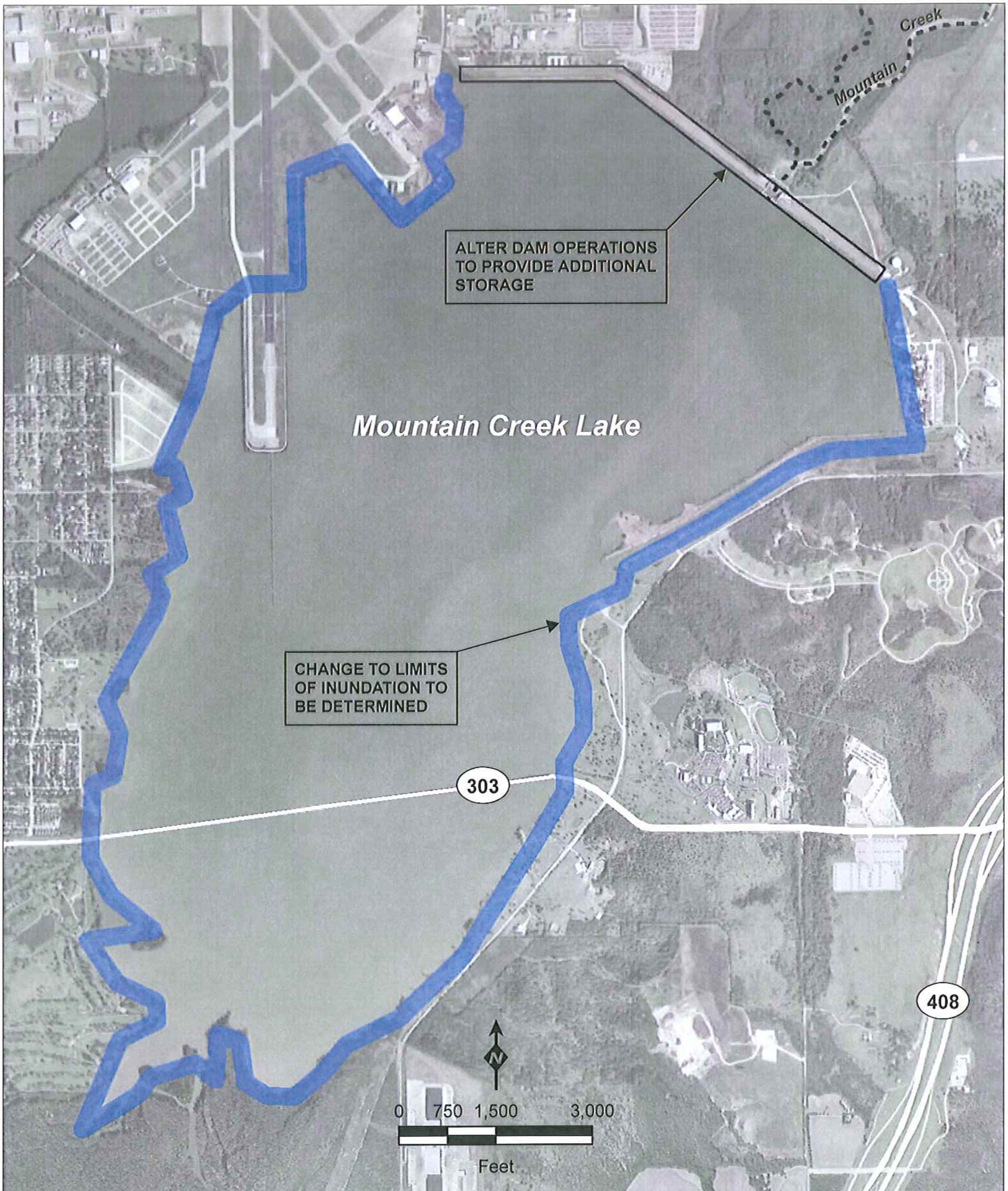

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #14
ALTERNATIVE 4A
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

P:\active\6028 Mountain Creek Flood Protection\GIS\exh\Final_Report\20080104\6028exh_Alt4a_Map.mxd

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #15
ALTERNATIVE 4B
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

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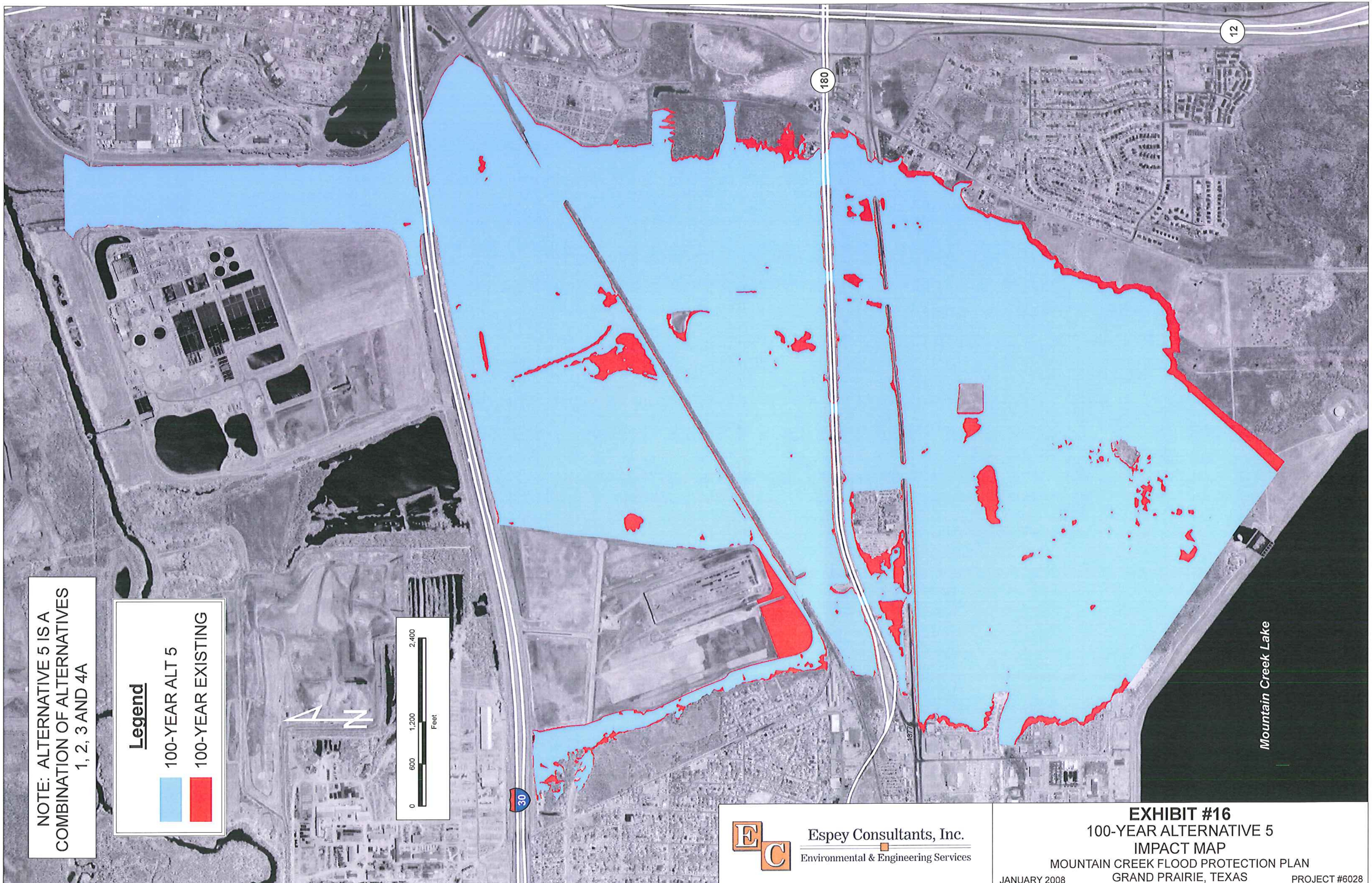

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #16
100-YEAR ALTERNATIVE 5 IMPACT MAP
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

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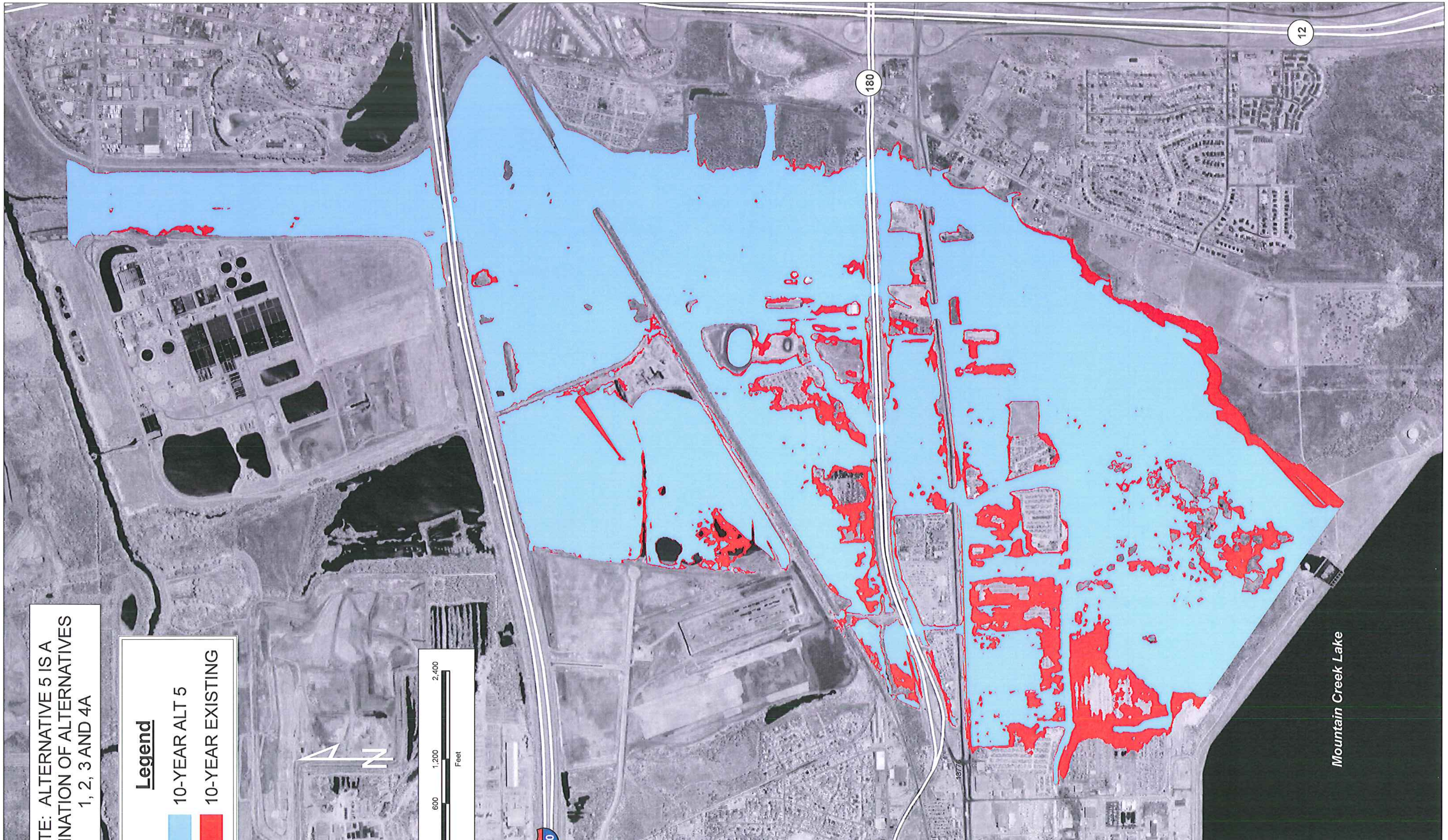

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #17
10-YEAR ALTERNATIVE 5
IMPACT MAP
MOUNTAIN CREEK FLOOD PROTECTION PLAN
GRAND PRAIRIE, TEXAS

JANUARY 2008

PROJECT #6028

P:\active\6028 Mountain Creek Flood Protection\GIS\exh\Final_Report\6028exh_Alt-5_10yr.mxd

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #18
ALTERNATIVE 6
Mountain Creek Flood Protection Plan
Grand Prairie, TX

JANUARY 2008

PROJECT No. 6028

P:\active\6028 Mountain Creek Flood Protection\GIS\exh\Final_Report\6028exh_Alt-6_Extents.mxd

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APPENDIX B
WEIGHTED CURVE NUMBER TABLE

Weighted Curve Number Table Summary:

Sub-basin	Area of NRCS Group (sq. ft)				Total Area	Percent of Soil Type				Weighted Curve Number
	A	B	C	D	(sq. mi)	%A	%B	%C	%D	AMC II
AC		177,231	47,020,089	29,311,280	2.7444	0%	0%	61%	38%	76.3
CC		8,600,874	389,764	72,230,158	2.9134	0%	11%	0%	89%	78.0
CWC-01		10,983,206		105,463,236	4.1769	0%	9%	0%	91%	78.2
CWC-02		5,361,366	625,861	118,644,113	4.4705	0%	4%	1%	95%	79.2
FC-01		20,350,744	7,007,943	28,410,543	2.0004	0%	36%	13%	51%	72.3
FC-02		11,036,054	1,833,487	37,226,594	1.7970	0%	22%	4%	74%	75.6
KC		9,236,252		93,991,815	3.7028	0%	9%	0%	91%	78.3
LMC-01			23,559,267	56,686,831	2.8784	0%	0%	29%	71%	78.2
LMC-02		928,312	16,919,407	37,203,955	1.9747	0%	2%	31%	68%	77.8
LMC-03				25,880,744	0.9283	0%	0%	0%	100%	80.0
LMC-04		17,286,330		24,414,242	1.4958	0%	41%	0%	59%	72.1
LMC-05		9,526,179		7,345,361	0.6052	0%	56%	0%	44%	69.3
NCWC		9,693,596	28,188,987	120,912,956	5.6960	0%	6%	18%	76%	77.8
NFC-01			18,102,010	67,101,582	3.0563	0%	0%	21%	79%	78.7
NFC-02		3,272,853	6,420,085	62,300,462	2.5824	0%	5%	9%	87%	78.6
OC-01			74,699,076	7,417,038	2.9455	0%	0%	91%	9%	74.5
OC-02		1,964,046	7,568,979	77,717,904	3.1297	0%	2%	9%	89%	79.1
SCWC		8,827,005	15,464,880	108,654,637	4.7688	0%	7%	12%	82%	78.0
SFC-01			1,836,046	136,111,586	4.9482	0%	0%	1%	99%	79.9
SFC-02		1,531,632	4,109,584	126,211,034	4.7295	0%	1%	3%	96%	79.6
SFC-03		20,409,467	6,509,035	111,832,737	4.9770	0%	15%	5%	81%	76.9
TB-01				14,319,861	0.5137	0%	0%	0%	100%	80.0
TB-02		4,836		24,822,486	0.8906	0%	0%	0%	100%	80.0
UMC-01		1,397,241	224,176	50,361,041	1.8646	0%	3%	0%	97%	79.5
UMC-02		617,611	41,835,015	74,882,114	4.2088	0%	1%	36%	64%	77.8
UMC-03		2,318,776		42,066,115	1.5921	0%	5%	0%	95%	79.0
UMC-04		66,027	17,954,908	54,335,544	2.5954	0%	0%	25%	75%	78.5
UMC-05		1,191,420	2,782,276	57,054,337	2.1891	0%	2%	5%	93%	79.4

APPENDIX C
WEIGHTED LAND USE TABLE

Existing Conditions Weighted Land Use Table

Composite IC (Existing Condition)

Sub-Basin	Impervious Area (sq. ft)	Drainage Area (sq. ft)	Percentage IC
AC	21,701,971	76,508,600	28%
CC	28,475,807	81,220,796	35%
CWC-01	42,716,287	116,446,442	37%
CWC-02	81,976,100	124,631,340	66%
FC-01	23,709,913	55,769,230	43%
FC-02	19,212,699	50,096,134	38%
KC	41,602,466	103,228,067	40%
LMC-01	17,339,086	80,246,099	22%
LMC-02	17,377,210	55,051,675	32%
LMC-03	11,986,135	25,880,745	46%
LMC-04	15,620,041	41,700,571	37%
LMC-05	5,903,978	16,871,540	35%
NCWC	71,144,079	158,795,539	45%
NFC-01	37,081,499	85,203,592	44%
NFC-02	22,736,789	71,993,399	32%
OC-01	15,382,945	82,116,114	19%
OC-02	31,803,441	87,250,929	36%
SCWC	57,430,558	132,946,463	43%
SFC-01	58,421,622	137,947,633	42%
SFC-02	48,292,907	131,852,250	37%
SFC-03	48,679,376	138,751,239	35%
TB-01	8,717,971	14,319,860	61%
TB-02	16,158,714	24,827,322	65%
UMC-01	16,996,446	51,982,458	33%
UMC-02	25,054,963	117,334,741	21%
UMC-03	5,905,691	44,384,890	13%
UMC-04	10,536,345	72,356,479	15%
UMC-05	33,637,704	61,028,033	55%

Ultimate Conditions Weighted Land Use Table

Composite IC (Ultimate Condition)				
Sub-Basin	**Impervious Area (sq. ft)**	**Drainage Area (sq.ft)**	**Calcualted Percentage IC**	**Adjusted Percentage IC***
AC	28,077,453	76,508,600	37%	37%
CC	25,857,412	81,220,796	32%	45%
CWC-01	39,788,589	116,446,442	36%	40%
CWC-02	83,265,274	124,631,340	67%	67%
FC-01	19,650,976	55,769,230	35%	43%
FC-02	17,554,002	50,096,134	36%	42%
KC	41,104,676	103,228,067	40%	45%
LMC-01	38,458,987	80,246,099	48%	48%
LMC-02	15,759,125	55,051,675	29%	37%
LMC-03	13,172,961	25,880,745	51%	51%
LMC-04	10,577,100	41,700,571	25%	40%
LMC-05	4,650,375	16,871,540	28%	65%
NCWC	89,164,904	158,795,539	55%	55%
NFC-01	32,392,898	85,203,592	38%	46%
NFC-02	40,384,263	71,993,399	56%	56%
OC-01	25,244,131	82,116,114	31%	31%
OC-02	48,811,492	87,250,929	56%	56%
SCWC	85,890,976	132,946,463	65%	65%
SFC-01	60,777,534	137,947,633	44%	44%
SFC-02	63,932,916	131,852,250	48%	48%
SFC-03	50,478,022	138,751,239	36%	36%
TB-01	11,898,790	14,319,860	83%	83%
TB-02	14,706,465	24,827,322	59%	65%
UMC-01	14,170,512	51,982,458	27%	38%
UMC-02	29,490,149	117,334,741	25%	25%
UMC-03	12,515,896	44,384,890	28%	28%
UMC-04	27,627,049	72,356,479	38%	38%
UMC-05	38,888,216	61,028,033	64%	64%

* Calcualted impervious percentage adjusted to ensure ultimate values are greater than calculated existing values.

APPENDIX D
TIME OF CONCENTRATION CALCULATIONS

Existing Conditions Time of Concentration Spreadsheets

Mountain Creek Watershed TR-55 Method of Computing the Time of Concentration Existing Conditions			LMC-01 (Lower Mountain Creek)	LMC-02 (Lower Mountain Creek)	LMC-03 (Lower Mountain Creek)	LMC-04 (Lower Mountain Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	300	300	50	50
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.020	0.038	0.014	0.014
Travel time	Tt	hours	0.314	0.243	0.086	0.086
Shallow Concentrated Flow		min.	18.8	14.6	5.2	5.2
Flow Length	L	feet	500	1,200	140	100
Slope	s	ft/ft	0.020	0.028	0.014	0.014
Surface (1=paved or 2=unpaved)		n/a	2	1	1	1
Velocity	V	ft/sec	2.29	3.45	2.44	2.44
Travel time	Tt	hours	0.061	0.097	0.016	0.011
Manning's Equation		min.	3.6	5.8	1.0	0.7
Flow Length	L	feet	11200	13470	2300	1800
Slope	S	ft/ft	0.008	0.014	0.025	0.020
roughness	n	n/a	0.06	0.05	0.03	0.02
Open Channel						
Bottom Width	BW	feet	70	60	15	0
Side Slopes (H:1)	H	feet	10	10	15	0
Depth	d	feet	4	3	3	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	3
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	440.00	270.00	180.00	7.07
Flow Rate	Q	cfs	1999.19	1632.01	2022.18	81.97
Velocity	V	ft/sec	4.54	6.04	11.23	11.60
Travel time	Tt	hours	0.685	0.619	0.057	0.043
Flow Length	L	feet	3000.00	2400.00	9750.00	3100.00
Slope	S	ft/ft	0.001	0.008	0.002	0.006
roughness	n	n/a	0.05	0.05	0.06	0.02
Open Channel						
Bottom Width	BW	feet	30	30	40	0
Side Slopes (H:1)	H	feet	10	10	10	0
Depth	d	feet	9	5	7	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	6
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1080.00	400.00	770.00	23.76
Flow Rate	Q	cfs	3023.88	2249.78	1946.63	226.04
Velocity	V	ft/sec	2.80	5.62	2.53	9.51
Travel time	Tt	hours	0.298	0.119	1.071	0.091
Flow Length	L	feet	6000.00	0.00	0.00	600.00
Slope	S	ft/ft	0.001	0.000	0.000	0.040
roughness	n	n/a	0.05	0.00	0.00	0.03
Open Channel						
Bottom Width	BW	feet	90	0	0	15
Side Slopes (H:1)	H	feet	10	0	0	5
Depth	d	feet	10	0	0	2
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1900.00	0.00	0.00	33.75
Flow Rate	Q	cfs	5233.46	0.00	0.00	360.26
Velocity	V	ft/sec	2.75	0.00	0.00	10.67
Travel time	Tt	hours	0.605	-	-	0.016
Flow Length	L	feet	0.00	0.00	0.00	9000.00
Slope	S	ft/ft	0.000	0.000	0.000	0.001
roughness	n	n/a	0.00	0.00	0.00	0.05
Open Channel						
Bottom Width	BW	feet	0	0	0	40
Side Slopes (H:1)	H	feet	0	0	0	10
Depth	d	feet	0	0	0	5
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	450.00
Flow Rate	Q	cfs	0.00	0.00	0.00	1090.28
Velocity	V	ft/sec	0.00	0.00	0.00	2.42
Travel time	Tt	hours	-	-	-	1.032
Total Travel Time	TC	hours	1.962	1.077	1.230	1.279
	TC	min.	117.7	64.6	73.8	76.7
Lag Time	TL	hours	1.18	0.65	0.74	0.77
	TL	min.	70.6	38.8	44.3	46.0

Mountain Creek Watershed TR-55 Method of Computing the Time of Concentration Existing Conditions						
			LMC-05 (Lower Mountain Creek)	**TB-01 (Thompsons Branch)**	**TB-02 (Thomspons Branch)**	**UMC-01 (Upper Mountain Creek)**
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	300	50	50	300
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.005	0.030	0.020	0.050
Travel time	Tt	hours	0.546	0.064	0.075	0.217
Shallow Concentrated Flow		min.	32.8	3.8	4.5	13.0
Flow Length	L	feet	500	1,000	600	250
Slope	s	ft/ft	0.005	0.030	0.007	0.050
Surface (1=paved or 2=unpaved)		n/a	2	2	1	2
Velocity	V	ft/sec	1.15	2.81	1.72	3.62
Travel time	Tt	hours	0.121	0.099	0.097	0.019
Manning's Equation		min.	7.3	5.9	5.8	1.2
Flow Length	L	feet	5000	4050	2800	9000
Slope	S	ft/ft	0.001	0.002	0.007	0.008
roughness	n	n/a	0.05	0.06	0.05	0.02
Open Channel						
Bottom Width	BW	feet	50	30	10	0
Side Slopes (H:1)	H	feet	5	3	20	0
Depth	d	feet	10	9	4	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	5
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1000.00	513.00	318.75	19.63
Flow Rate	Q	cfs	2339.93	1860.75	1230.07	202.43
Velocity	V	ft/sec	2.34	3.63	3.86	10.31
Travel time	Tt	hours	0.594	0.310	0.202	0.242
Flow Length	L	feet	6200.00	0.00	3600.00	10000.00
Slope	S	ft/ft	0.001	0.000	0.003	0.008
roughness	n	n/a	0.05	0.00	0.03	0.05
Open Channel						
Bottom Width	BW	feet	50	0	4	50
Side Slopes (H:1)	H	feet	5	0	3	10
Depth	d	feet	12	0	8	2
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1320.00	0.00	208.00	140.00
Flow Rate	Q	cfs	3417.45	0.00	1447.89	500.24
Velocity	V	ft/sec	2.59	0.00	6.96	3.57
Travel time	Tt	hours	0.665	-	0.144	0.777
Flow Length	L	feet	0.00	0.00	5000.00	0.00
Slope	S	ft/ft	0.000	0.000	0.012	0.000
roughness	n	n/a	0.00	0.00	0.05	0.00
Open Channel						
Bottom Width	BW	feet	0	0	30	0
Side Slopes (H:1)	H	feet	0	0	20	0
Depth	d	feet	0	0	4	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	350.00	0.00
Flow Rate	Q	cfs	0.00	0.00	1808.95	0.00
Velocity	V	ft/sec	0.00	0.00	5.17	0.00
Travel time	Tt	hours	-	-	0.269	-
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Total Travel Time	TC	hours	1.926	0.473	0.785	1.257
	TC	min.	115.6	28.4	47.1	75.4
Lag Time	TL	hours	1.16	0.28	0.47	0.75
	TL	min.	69.3	17.0	28.3	45.2

Mountain Creek Watershed TR-55 Method of Computing the Time of Concentration Existing Conditions						
			UMC-02 (Upper Mountain Creek)	**UMC-03 (Upper Mountain Creek)**	**UMC-04 (Upper Mountain Creek)**	**UMC-05 (Upper Mountain Creek)**
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	300	300	300	300
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.014	0.017	0.050	0.020
Travel time	Tt	hours	0.362	0.335	0.217	0.314
Shallow Concentrated Flow		min.	21.7	20.1	13.0	18.8
Flow Length	L	feet	1,350	590	500	500
Slope	s	ft/ft	0.014	0.017	0.050	0.020
Surface (1=paved or 2=unpaved)		n/a	2	2	2	2
Velocity	V	ft/sec	1.92	2.11	3.62	2.29
Travel time	Tt	hours	0.196	0.078	0.038	0.061
Manning's Equation		min.	11.7	4.7	2.3	3.6
Flow Length	L	feet	16000	18000	6000	8000
Slope	S	ft/ft	0.018	0.001	0.030	0.020
roughness	n	n/a	0.05	0.05	0.05	0.05
Open Channel						
Bottom Width	BW	feet	40	100	50	50
Side Slopes (H:1)	H	feet	10	30	5	5
Depth	d	feet	3	15	2	3
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	210.00	8250.00	120.00	195.00
Flow Rate	Q	cfs	1374.14	22439.35	883.87	1481.15
Velocity	V	ft/sec	6.54	2.72	7.37	7.60
Travel time	Tt	hours	0.679	1.838	0.226	0.293
Flow Length	L	feet	0.00	0.00	6000.00	0.00
Slope	S	ft/ft	0.000	0.000	0.010	0.000
roughness	n	n/a	0.00	0.00	0.05	0.00
Open Channel						
Bottom Width	BW	feet	0	0	70	0
Side Slopes (H:1)	H	feet	0	0	15	0
Depth	d	feet	0	0	3	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	345.00	0.00
Flow Rate	Q	cfs	0.00	0.00	1714.55	0.00
Velocity	V	ft/sec	0.00	0.00	4.97	0.00
Travel time	Tt	hours	-	-	0.335	-
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Total Travel Time	TC	hours	1.237	2.251	0.817	0.667
	TC	min.	74.2	135.0	49.0	40.0
Lag Time	TL	hours	0.74	1.35	0.49	0.40
	TL	min.	44.5	81.0	29.4	24.0

Mountain Creek Watershed TR-55 Method of Computing the Time of Concentration Existing Conditions			AC (Artesian Creek)	OC-01 (O'guinn Creek)	OC-02 (O'Guinn Creek)	CC (Cedar Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	300	50	300	150
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.010	0.020	0.025	0.020
Travel time	Tt	hours	0.414	0.075	0.287	0.180
Shallow Concentrated Flow		min.	24.8	4.5	17.2	10.8
Flow Length	L	feet	1,000	1,200	920	650
Slope	s	ft/ft	0.010	0.025	0.025	0.004
Surface (1=paved or 2=unpaved)		n/a	1	1	2	1
Velocity	V	ft/sec	2.06	3.26	2.56	1.30
Travel time	Tt	hours	0.135	0.102	0.100	0.139
Manning's Equation		min.	8.1	6.1	6.0	8.3
Flow Length	L	feet	10000	13000	10000	1850
Slope	S	ft/ft	0.018	0.011	0.011	0.002
roughness	n	n/a	0.05	0.05	0.05	0.02
Open Channel						
Bottom Width	BW	feet	40	50	50	0
Side Slopes (H:1)	H	feet	5	5	10	0
Depth	d	feet	3	3	4	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	7
Span (0 if circular)	S	feet	0	0	0	4
Cross-Sectional Area	X-A	feet^2	165.00	195.00	360.00	28.00
Flow Rate	Q	cfs	1145.62	1098.45	2214.36	180.63
Velocity	V	ft/sec	6.94	5.63	6.15	6.45
Travel time	Tt	hours	0.400	0.641	0.452	0.080
Flow Length	L	feet	12000.00	0.00	0.00	2800.00
Slope	S	ft/ft	0.020	0.000	0.000	0.002
roughness	n	n/a	0.05	0.00	0.00	0.05
Open Channel						
Bottom Width	BW	feet	70	0	0	15
Side Slopes (H:1)	H	feet	10	0	0	5
Depth	d	feet	3	0	0	4
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	300.00	0.00	0.00	140.00
Flow Rate	Q	cfs	2204.54	0.00	0.00	344.54
Velocity	V	ft/sec	7.35	0.00	0.00	2.46
Travel time	Tt	hours	0.454	-	-	0.316
Flow Length	L	feet	0.00	0.00	0.00	4300.00
Slope	S	ft/ft	0.000	0.000	0.000	0.002
roughness	n	n/a	0.00	0.00	0.00	0.05
Open Channel						
Bottom Width	BW	feet	0	0	0	25
Side Slopes (H:1)	H	feet	0	0	0	5
Depth	d	feet	0	0	0	4
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	180.00
Flow Rate	Q	cfs	0.00	0.00	0.00	469.26
Velocity	V	ft/sec	0.00	0.00	0.00	2.61
Travel time	Tt	hours	-	-	-	0.458
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Total Travel Time	TC	hours	1.402	0.818	0.838	1.173
	TC	min.	84.1	49.1	50.3	70.4
Lag Time	TL	hours	0.84	0.49	0.50	0.70
	TL	min.	50.5	29.5	30.2	42.2

Mountain Creek Watershed TR-55 Method of Computing the Time of Concentration Existing Conditions						
			CWC-01 (Cottonwood Creek)	CWC-02 (Cottonwood Creek)	NCWC (North Cottonwood Creek)	SCWC (South Cottonwood Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	150	50	100	100
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.018	0.005	0.020	0.020
Travel time	Tt	hours	0.188	0.130	0.130	0.130
Shallow Concentrated Flow		min.	11.3	7.8	7.8	7.8
Flow Length	L	feet	650	300	1,300	2,450
Slope	s	ft/ft	0.018	0.005	0.025	0.022
Surface (1=paved or 2=unpaved)		n/a	2	2	1	1
Velocity	V	ft/sec	2.17	1.15	3.26	3.06
Travel time	Tt	hours	0.083	0.073	0.111	0.223
Manning's Equation		min.	5.0	4.4	6.7	13.4
Flow Length	L	feet	3700	10000	22000	24600
Slope	S	ft/ft	0.005	0.003	0.006	0.006
roughness	n	n/a	0.02	0.05	0.06	0.06
Open Channel						
Bottom Width	BW	feet	0	50	70	100
Side Slopes (H:1)	H	feet	0	10	10	10
Depth	d	feet	0	2	5	5
...or Closed Conduit						
Rise / Diameter	R / D	feet	3	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	7.07	140.00	600.00	750.00
Flow Rate	Q	cfs	40.98	306.33	2670.34	3476.62
Velocity	V	ft/sec	5.80	2.19	4.45	4.64
Travel time	Tt	hours	0.177	1.269	1.373	1.474
Flow Length	L	feet	2500	0.00	0.00	0.00
Slope	S	ft/ft	0.005	0.000	0.000	0.000
roughness	n	n/a	0.02	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	5	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	19.63	0.00	0.00	0.00
Flow Rate	Q	cfs	160.04	0.00	0.00	0.00
Velocity	V	ft/sec	8.15	0.00	0.00	0.00
Travel time	Tt	hours	0.085	-	-	-
Flow Length	L	feet	1900	0.00	0.00	0.00
Slope	S	ft/ft	0.005	0.000	0.000	0.000
roughness	n	n/a	0.02	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	8	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	50.27	0.00	0.00	0.00
Flow Rate	Q	cfs	560.45	0.00	0.00	0.00
Velocity	V	ft/sec	11.15	0.00	0.00	0.00
Travel time	Tt	hours	0.047	-	-	-
Flow Length	L	feet	6100.00	0.00	0.00	0.00
Slope	S	ft/ft	0.007	0.000	0.000	0.000
roughness	n	n/a	0.06	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	60	0	0	0
Side Slopes (H:1)	H	feet	10	0	0	0
Depth	d	feet	3	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	270.00	0.00	0.00	0.00
Flow Rate	Q	cfs	961.67	0.00	0.00	0.00
Velocity	V	ft/sec	3.56	0.00	0.00	0.00
Travel time	Tt	hours	0.476	-	-	-
Total Travel Time	TC	hours	1.057	1.473	1.614	1.827
	TC	min.	63.4	88.4	96.9	109.6
Lag Time	TL	hours	0.63	0.88	0.97	1.10
	TL	min.	38.0	53.0	58.1	65.8

Mountain Creek Watershed
TR-55 Method of Computing the Time of Concentration
Existing Conditions

			FC-01 (Fish Creek)	FC-02 (Fish Creek)	KC (Kirby Creek)	NFC-02 (North Fish Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	300	100	300	300
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.017	0.011	0.050	0.013
Travel time	Tt	hours	0.335	0.165	0.217	0.379
Shallow Concentrated Flow		min.	20.1	9.9	13.0	22.7
Flow Length	L	feet	750	1,350	2,700	750
Slope	s	ft/ft	0.017	0.011	0.050	0.013
Surface (1=paved or 2=unpaved)		n/a	1	1	1	1
Velocity	V	ft/sec	2.69	2.16	4.61	2.30
Travel time	Tt	hours	0.078	0.174	0.163	0.090
Manning's Equation		min.	4.7	10.4	9.8	5.4
Flow Length	L	feet	3100	7000	5000	21000
Slope	S	ft/ft	0.010	0.006	0.006	0.006
roughness	n	n/a	0.05	0.06	0.05	0.05
Open Channel						
Bottom Width	BW	feet	70	100	60	70
Side Slopes (H:1)	H	feet	10	15	60	10
Depth	d	feet	3	5	3	5
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	5	5
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	300.00	875.00	720.00	600.00
Flow Rate	Q	cfs	1558.84	3711.67	2380.42	3067.99
Velocity	V	ft/sec	5.20	4.24	3.31	5.11
Travel time	Tt	hours	0.166	0.458	0.420	1.141
Flow Length	L	feet	10800.00	0.00	5500.00	0.00
Slope	S	ft/ft	0.006	0.000	0.006	0.000
roughness	n	n/a	0.05	0.00	0.05	0.00
Open Channel						
Bottom Width	BW	feet	100	0	60	0
Side Slopes (H:1)	H	feet	20	0	10	0
Depth	d	feet	5	0	6	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1000.00	0.00	720.00	0.00
Flow Rate	Q	cfs	5148.18	0.00	4000.94	0.00
Velocity	V	ft/sec	5.15	0.00	5.56	0.00
Travel time	Tt	hours	0.583	-	0.275	-
Flow Length	L	feet	0.00	0.00	8000.00	0.00
Slope	S	ft/ft	0.000	0.000	0.004	0.000
roughness	n	n/a	0.00	0.00	0.05	0.00
Open Channel						
Bottom Width	BW	feet	0	0	90	0
Side Slopes (H:1)	H	feet	0	0	5	0
Depth	d	feet	0	0	8	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	1040.00	0.00
Flow Rate	Q	cfs	0.00	0.00	6516.43	0.00
Velocity	V	ft/sec	0.00	0.00	6.27	0.00
Travel time	Tt	hours	-	-	0.355	-
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Total Travel Time	TC	hours	1.161	0.797	1.430	1.610
	TC	min.	69.6	47.8	85.8	96.6
Lag Time	TL	hours	0.70	0.48	0.86	0.97
	TL	min.	41.8	28.7	51.5	58.0

Mountain Creek Watershed TR-55 Method of Computing the Time of Concentration Existing Conditions			NFC-01 (North Fish Creek)	SFC-01 (South Fish Creek)	SFC-02 (South Fish Creek)	SFC-03 (South Fish Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	100	50	300	300
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.033	0.008	0.027	0.027
Travel time	Tt	hours	0.107	0.108	0.278	0.278
Shallow Concentrated Flow		min.	6.4	6.5	16.7	16.7
Flow Length	L	feet	950	250	250	1,200
Slope	s	ft/ft	0.033	0.008	0.008	0.010
Surface (1=paved or 2=unpaved)		n/a	1	1	1	1
Velocity	V	ft/sec	3.74	1.84	1.84	2.06
Travel time	Tt	hours	0.071	0.038	0.038	0.162
Manning's Equation		min.	4.2	2.3	2.3	9.7
Flow Length	L	feet	15000	24900	15000	8000
Slope	S	ft/ft	0.006	0.004	0.005	0.011
roughness	n	n/a	0.06	0.06	0.05	0.05
Open Channel						
Bottom Width	BW	feet	40	100	60	70
Side Slopes (H:1)	H	feet	50	10	30	10
Depth	d	feet	5	5	5	3
...or Closed Conduit						
Rise / Diameter	R / D	feet	5	5	5	5
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1450.00	750.00	1050.00	300.00
Flow Rate	Q	cfs	5387.93	2838.65	4515.40	1634.93
Velocity	V	ft/sec	3.72	3.78	4.30	5.45
Travel time	Tt	hours	1.121	1.827	0.969	0.408
Flow Length	L	feet	0.00	0.00	5000.00	14500.00
Slope	S	ft/ft	0.000	0.000	0.004	0.003
roughness	n	n/a	0.00	0.00	0.05	0.05
Open Channel						
Bottom Width	BW	feet	0	0	70	50
Side Slopes (H:1)	H	feet	0	0	10	10
Depth	d	feet	0	0	6	6
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	687.50	660.00
Flow Rate	Q	cfs	0.00	0.00	3159.78	2654.93
Velocity	V	ft/sec	0.00	0.00	4.60	4.02
Travel time	Tt	hours	-	-	0.302	1.001
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Total Travel Time	TC	hours	1.298	1.973	1.587	1.849
	TC	min.	77.9	118.4	95.2	110.9
Lag Time	TL	hours	0.78	1.18	0.95	1.11
	TL	min.	46.7	71.0	57.1	66.6

Ultimate Conditions Time of Concentration Spreadsheets

Mountain Creek Watershed TR-55 Method of Computing the Time of Concentration Ultimate Conditions			LMC-01 (Lower Mountain Creek)	LMC-02 (Lower Mountain Creek)	LMC-03 (Lower Mountain Creek)	LMC-04 (Lower Mountain Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	100	100	50	50
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.020	0.038	0.014	0.014
Travel time	Tt	hours	0.130	0.101	0.086	0.086
Shallow Concentrated Flow		min.	7.8	6.0	5.2	5.2
Flow Length	L	feet	700	1,400	140	100
Slope	s	ft/ft	0.020	0.028	0.014	0.014
Surface (1=paved or 2=unpaved)		n/a	2	1	1	1
Velocity	V	ft/sec	2.29	3.45	2.44	2.44
Travel time	Tt	hours	0.085	0.113	0.016	0.011
Manning's Equation		min.	5.1	6.8	1.0	0.7
Flow Length	L	feet	11200	13470	2300	1800
Slope	S	ft/ft	0.008	0.014	0.025	0.020
roughness	n	n/a	0.06	0.05	0.03	0.02
Open Channel						
Bottom Width	BW	feet	70	60	15	0
Side Slopes (H:1)	H	feet	10	10	15	0
Depth	d	feet	4	3	3	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	3
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	440.00	270.00	180.00	7.07
Flow Rate	Q	cfs	1999.19	1632.01	2022.18	81.97
Velocity	V	ft/sec	4.54	6.04	11.23	11.60
Travel time	Tt	hours	0.685	0.619	0.057	0.043
Flow Length	L	feet	3000.00	2400.00	9750.00	3100.00
Slope	S	ft/ft	0.001	0.008	0.002	0.006
roughness	n	n/a	0.05	0.05	0.06	0.02
Open Channel						
Bottom Width	BW	feet	30	30	40	0
Side Slopes (H:1)	H	feet	10	10	10	0
Depth	d	feet	9	5	7	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	6
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1080.00	400.00	770.00	23.76
Flow Rate	Q	cfs	3023.88	2249.78	1946.63	226.04
Velocity	V	ft/sec	2.80	5.62	2.53	9.51
Travel time	Tt	hours	0.298	0.119	1.071	0.091
Flow Length	L	feet	6000.00	0.00	0.00	600.00
Slope	S	ft/ft	0.001	0.000	0.000	0.040
roughness	n	n/a	0.05	0.00	0.00	0.03
Open Channel						
Bottom Width	BW	feet	90	0	0	15
Side Slopes (H:1)	H	feet	10	0	0	5
Depth	d	feet	10	0	0	2
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1900.00	0.00	0.00	33.75
Flow Rate	Q	cfs	5233.46	0.00	0.00	360.26
Velocity	V	ft/sec	2.75	0.00	0.00	10.67
Travel time	Tt	hours	0.605	-	-	0.016
Flow Length	L	feet	0.00	0.00	0.00	9000.00
Slope	S	ft/ft	0.000	0.000	0.000	0.001
roughness	n	n/a	0.00	0.00	0.00	0.05
Open Channel						
Bottom Width	BW	feet	0	0	0	40
Side Slopes (H:1)	H	feet	0	0	0	10
Depth	d	feet	0	0	0	5
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	450.00
Flow Rate	Q	cfs	0.00	0.00	0.00	1090.28
Velocity	V	ft/sec	0.00	0.00	0.00	2.42
Travel time	Tt	hours	-	-	-	1.032
Total Travel Time	TC	hours	1.944	0.951	1.230	1.279
	TC	min.	116.6	57.1	73.8	76.7
Lag Time	TL	hours	1.17	0.57	0.74	0.77
	TL	min.	70.0	34.2	44.3	46.0

Mountain Creek Watershed TR-55 Method of Computing the Time of Concentration Ultimate Conditions			LMC-05 (Lower Mountain Creek)	TB-01 (Thompsons Branch)	TB-02 (Thomspons Branch)	UMC-01 (Upper Mountain Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	300	50	50	150
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.005	0.030	0.020	0.050
Travel time	Tt	hours	0.546	0.064	0.075	0.125
Shallow Concentrated Flow		min.	32.8	3.8	4.5	7.5
Flow Length	L	feet	500	1,000	600	400
Slope	s	ft/ft	0.005	0.030	0.007	0.050
Surface (1=paved or 2=unpaved)		n/a	2	2	1	2
Velocity	V	ft/sec	1.15	2.81	1.72	3.62
Travel time	Tt	hours	0.121	0.099	0.097	0.031
Manning's Equation		min.	7.3	5.9	5.8	1.8
Flow Length	L	feet	5000	4050	2800	9000
Slope	S	ft/ft	0.001	0.002	0.007	0.008
roughness	n	n/a	0.05	0.06	0.05	0.02
Open Channel						
Bottom Width	BW	feet	50	30	10	0
Side Slopes (H:1)	H	feet	5	3	20	0
Depth	d	feet	10	9	4	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	5
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1000.00	513.00	318.75	19.63
Flow Rate	Q	cfs	2339.93	1860.75	1230.07	202.43
Velocity	V	ft/sec	2.34	3.63	3.86	10.31
Travel time	Tt	hours	0.594	0.310	0.202	0.242
Flow Length	L	feet	6200.00	0.00	3600.00	10000.00
Slope	S	ft/ft	0.001	0.000	0.003	0.008
roughness	n	n/a	0.05	0.00	0.03	0.05
Open Channel						
Bottom Width	BW	feet	50	0	4	50
Side Slopes (H:1)	H	feet	5	0	3	10
Depth	d	feet	12	0	8	2
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1320.00	0.00	208.00	140.00
Flow Rate	Q	cfs	3417.45	0.00	1447.89	500.24
Velocity	V	ft/sec	2.59	0.00	6.96	3.57
Travel time	Tt	hours	0.665	-	0.144	0.777
Flow Length	L	feet	0.00	0.00	5000.00	0.00
Slope	S	ft/ft	0.000	0.000	0.012	0.000
roughness	n	n/a	0.00	0.00	0.05	0.00
Open Channel						
Bottom Width	BW	feet	0	0	30	0
Side Slopes (H:1)	H	feet	0	0	20	0
Depth	d	feet	0	0	4	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	350.00	0.00
Flow Rate	Q	cfs	0.00	0.00	1808.95	0.00
Velocity	V	ft/sec	0.00	0.00	5.17	0.00
Travel time	Tt	hours	-	-	0.269	-
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Total Travel Time	TC	hours	1.926	0.473	0.785	1.175
	TC	min.	115.6	28.4	47.1	70.5
Lag Time	TL	hours	1.16	0.28	0.47	0.71
	TL	min.	69.3	17.0	28.3	42.3

Mountain Creek Watershed TR-55 Method of Computing the Time of Concentration Ultimate Conditions			UMC-02 (Upper Mountain Creek)	UMC-03 (Upper Mountain Creek)	UMC-04 (Upper Mountain Creek)	UMC-05 (Upper Mountain Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	300	300	300	300
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.014	0.017	0.050	0.020
Travel time	Tt	hours	0.362	0.335	0.217	0.314
Shallow Concentrated Flow		min.	21.7	20.1	13.0	18.8
Flow Length	L	feet	400	590	500	500
Slope	s	ft/ft	0.014	0.017	0.050	0.020
Surface (1=paved or 2=unpaved)		n/a	2	2	2	2
Velocity	V	ft/sec	1.92	2.11	3.62	2.29
Travel time	Tt	hours	0.058	0.078	0.038	0.061
Manning's Equation		min.	3.5	4.7	2.3	3.6
Flow Length	L	feet	17000	18000	6000	8000
Slope	S	ft/ft	0.018	0.001	0.030	0.020
roughness	n	n/a	0.05	0.05	0.05	0.05
Open Channel						
Bottom Width	BW	feet	40	100	50	50
Side Slopes (H:1)	H	feet	10	30	5	5
Depth	d	feet	3	15	2	3
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	210.00	8250.00	120.00	195.00
Flow Rate	Q	cfs	1374.14	22439.35	883.87	1481.15
Velocity	V	ft/sec	6.54	2.72	7.37	7.60
Travel time	Tt	hours	0.722	1.838	0.226	0.293
Flow Length	L	feet	0.00	0.00	6000.00	0.00
Slope	S	ft/ft	0.000	0.000	0.010	0.000
roughness	n	n/a	0.00	0.00	0.05	0.00
Open Channel						
Bottom Width	BW	feet	0	0	70	0
Side Slopes (H:1)	H	feet	0	0	15	0
Depth	d	feet	0	0	3	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	345.00	0.00
Flow Rate	Q	cfs	0.00	0.00	1714.55	0.00
Velocity	V	ft/sec	0.00	0.00	4.97	0.00
Travel time	Tt	hours	-	-	0.335	-
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Total Travel Time	TC	hours	1.141	2.251	0.817	0.667
	TC	min.	68.5	135.0	49.0	40.0
Lag Time	TL	hours	0.68	1.35	0.49	0.40
	TL	min.	41.1	81.0	29.4	24.0

Mountain Creek Watershed TR-55 Method of Computing the Time of Concentration Ultimate Conditions			AC (Artesian Creek)	OC-01 (O'guinn Creek)	OC-02 (O'Guinn Creek)	CC (Cedar Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	50	50	300	50
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.010	0.020	0.025	0.020
Travel time	Tt	hours	0.099	0.075	0.287	0.075
Shallow Concentrated Flow		min.	5.9	4.5	17.2	4.5
Flow Length	L	feet	1,200	400	300	650
Slope	s	ft/ft	0.010	0.025	0.025	0.004
Surface (1=paved or 2=unpaved)		n/a	1	1	2	1
Velocity	V	ft/sec	2.06	3.26	2.56	1.30
Travel time	Tt	hours	0.162	0.034	0.033	0.139
Manning's Equation		min.	9.7	2.0	2.0	8.3
Flow Length	L	feet	10000	13800	10620	1850
Slope	S	ft/ft	0.018	0.011	0.011	0.002
roughness	n	n/a	0.05	0.05	0.05	0.02
Open Channel						
Bottom Width	BW	feet	40	50	50	0
Side Slopes (H:1)	H	feet	5	3	10	0
Depth	d	feet	3	3	4	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	7
Span (0 if circular)	S	feet	0	0	0	4
Cross-Sectional Area	X-A	feet^2	165.00	195.00	360.00	28.00
Flow Rate	Q	cfs	1145.62	1098.45	2214.36	180.63
Velocity	V	ft/sec	6.94	5.63	6.15	6.45
Travel time	Tt	hours	0.400	0.681	0.480	0.080
Flow Length	L	feet	12000.00	0.00	0.00	2800.00
Slope	S	ft/ft	0.020	0.000	0.000	0.002
roughness	n	n/a	0.05	0.00	0.00	0.05
Open Channel						
Bottom Width	BW	feet	70	0	0	15
Side Slopes (H:1)	H	feet	10	0	0	5
Depth	d	feet	3	0	0	4
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	300.00	0.00	0.00	140.00
Flow Rate	Q	cfs	2204.54	0.00	0.00	344.54
Velocity	V	ft/sec	7.35	0.00	0.00	2.46
Travel time	Tt	hours	0.454	-	-	0.316
Flow Length	L	feet	0.00	0.00	0.00	4300.00
Slope	S	ft/ft	0.000	0.000	0.000	0.002
roughness	n	n/a	0.00	0.00	0.00	0.05
Open Channel						
Bottom Width	BW	feet	0	0	0	25
Side Slopes (H:1)	H	feet	0	0	0	5
Depth	d	feet	0	0	0	4
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	180.00
Flow Rate	Q	cfs	0.00	0.00	0.00	469.26
Velocity	V	ft/sec	0.00	0.00	0.00	2.61
Travel time	Tt	hours	-	-	-	0.458
Flow Length	L	feet	0.00	0.00	0.00	14000.00
Slope	S	ft/ft	0.000	0.000	0.000	0.005
roughness	n	n/a	0.00	0.00	0.00	0.05
Open Channel						
Bottom Width	BW	feet	0	0	0	30
Side Slopes (H:1)	H	feet	0	0	0	5
Depth	d	feet	0	0	0	5
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	275.00
Flow Rate	Q	cfs	0.00	0.00	0.00	1335.06
Velocity	V	ft/sec	0.00	0.00	0.00	4.85
Travel time	Tt	hours	-	-	-	0.801
Total Travel Time	TC	hours	1.114	0.789	0.799	1.868
	TC	min.	66.9	47.4	47.9	112.1
Lag Time	TL	hours	0.67	0.47	0.48	1.12
	TL	min.	40.1	28.4	28.8	67.3

Mountain Creek Watershed
TR-55 Method of Computing the Time of Concentration
Ultimate Conditions

			CWC-01 (Cottonwood Creek)	CWC-02 (Cottonwood Creek)	NCWC (North Cottonwood Creek)	SCWC (South Cottonwood Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	150	50	100	100
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.018	0.005	0.020	0.020
Travel time	Tt	hours	0.188	0.130	0.130	0.130
Shallow Concentrated Flow		min.	11.3	7.8	7.8	7.8
Flow Length	L	feet	650	300	1,300	2,450
Slope	s	ft/ft	0.018	0.005	0.025	0.022
Surface (1=paved or 2=unpaved)		n/a	2	2	1	1
Velocity	V	ft/sec	2.17	1.15	3.26	3.06
Travel time	Tt	hours	0.083	0.073	0.111	0.223
Manning's Equation		min.	5.0	4.4	6.7	13.4
Flow Length	L	feet	3700	10000	22000	24600
Slope	S	ft/ft	0.005	0.003	0.006	0.006
roughness	n	n/a	0.02	0.05	0.06	0.06
Open Channel						
Bottom Width	BW	feet	0	50	70	100
Side Slopes (H:1)	H	feet	0	10	10	10
Depth	d	feet	0	2	5	5
...or Closed Conduit						
Rise / Diameter	R / D	feet	3	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	7.07	140.00	600.00	750.00
Flow Rate	Q	cfs	40.98	306.33	2670.34	3476.62
Velocity	V	ft/sec	5.80	2.19	4.45	4.64
Travel time	Tt	hours	0.177	1.269	1.373	1.474
Flow Length	L	feet	2500	0.00	0.00	0.00
Slope	S	ft/ft	0.005	0.000	0.000	0.000
roughness	n	n/a	0.02	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	5	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	19.63	0.00	0.00	0.00
Flow Rate	Q	cfs	160.04	0.00	0.00	0.00
Velocity	V	ft/sec	8.15	0.00	0.00	0.00
Travel time	Tt	hours	0.085	-	-	-
Flow Length	L	feet	1900	0.00	0.00	0.00
Slope	S	ft/ft	0.005	0.000	0.000	0.000
roughness	n	n/a	0.02	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	8	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	50.27	0.00	0.00	0.00
Flow Rate	Q	cfs	560.45	0.00	0.00	0.00
Velocity	V	ft/sec	11.15	0.00	0.00	0.00
Travel time	Tt	hours	0.047	-	-	-
Flow Length	L	feet	6100.00	0.00	0.00	0.00
Slope	S	ft/ft	0.007	0.000	0.000	0.000
roughness	n	n/a	0.06	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	60	0	0	0
Side Slopes (H:1)	H	feet	10	0	0	0
Depth	d	feet	3	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	270.00	0.00	0.00	0.00
Flow Rate	Q	cfs	961.67	0.00	0.00	0.00
Velocity	V	ft/sec	3.56	0.00	0.00	0.00
Travel time	Tt	hours	0.476	-	-	-
Total Travel Time	TC	hours	1.057	1.473	1.614	1.827
	TC	min.	63.4	88.4	96.9	109.6
Lag Time	TL	hours	0.63	0.88	0.97	1.10
	TL	min.	38.0	53.0	58.1	65.8

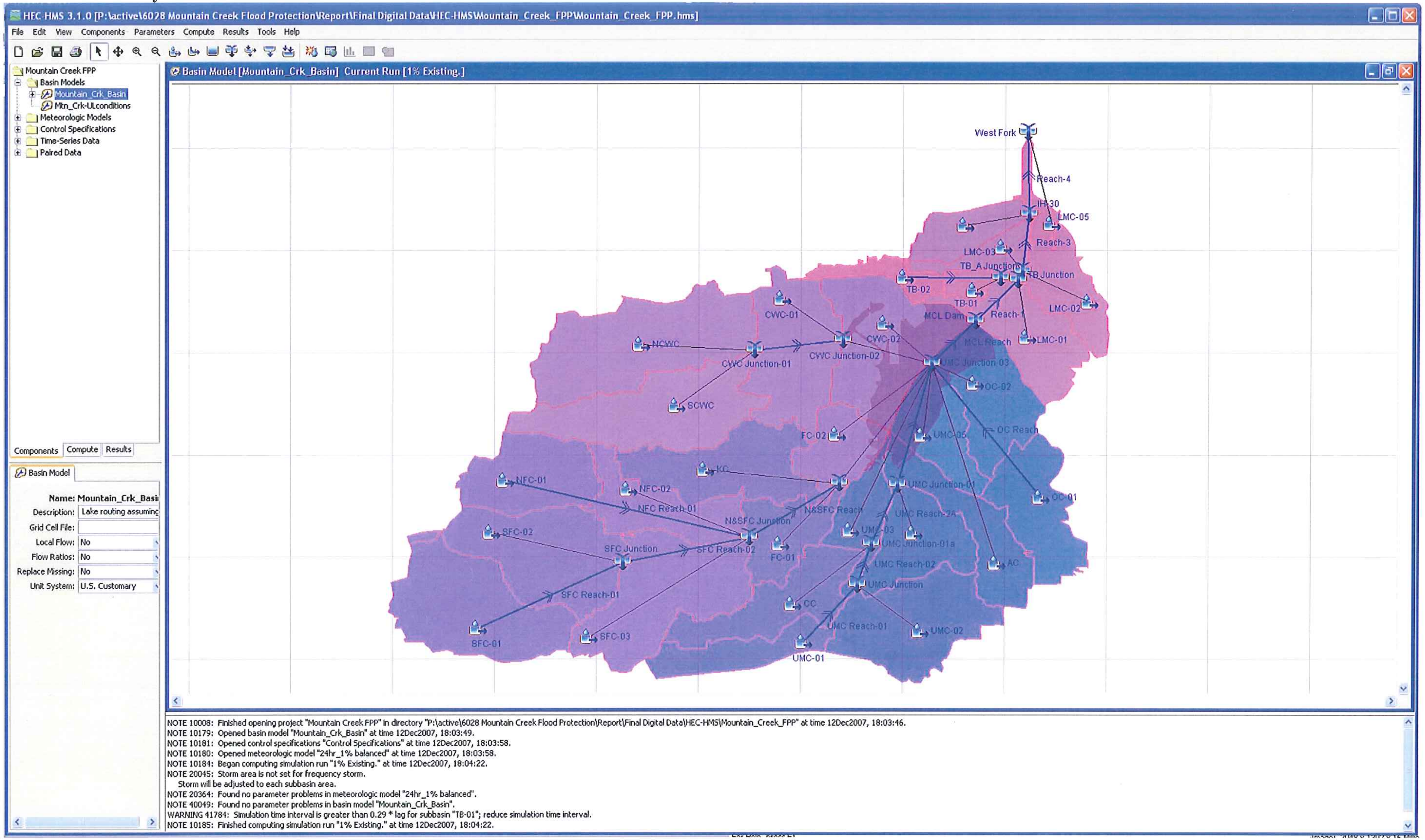
Mountain Creek Watershed TR-55 Method of Computing the Time of Concentration Ultimate Conditions						
			FC-01 (Fish Creek)	FC-02 (Fish Creek)	KC (Kirby Creek)	NFC-02 (North Fish Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	300	50	300	300
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.017	0.011	0.050	0.013
Travel time	Tt	hours	0.335	0.095	0.217	0.379
Shallow Concentrated Flow		min.	20.1	5.7	13.0	22.7
Flow Length	L	feet	750	1,350	2,700	750
Slope	s	ft/ft	0.017	0.011	0.050	0.013
Surface (1=paved or 2=unpaved)		n/a	1	1	1	1
Velocity	V	ft/sec	2.69	2.16	4.61	2.30
Travel time	Tt	hours	0.078	0.174	0.163	0.090
Manning's Equation		min.	4.7	10.4	9.8	5.4
Flow Length	L	feet	3100	7000	5000	21000
Slope	S	ft/ft	0.010	0.006	0.006	0.006
roughness	n	n/a	0.05	0.06	0.05	0.05
Open Channel						
Bottom Width	BW	feet	70	100	60	70
Side Slopes (H:1)	H	feet	10	15	60	10
Depth	d	feet	3	5	3	5
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	5	5
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	300.00	875.00	720.00	600.00
Flow Rate	Q	cfs	1558.84	3711.67	2380.42	3067.99
Velocity	V	ft/sec	5.20	4.24	3.31	5.11
Travel time	Tt	hours	0.166	0.458	0.420	1.141
Flow Length	L	feet	10800.00	0.00	5500.00	0.00
Slope	S	ft/ft	0.006	0.000	0.006	0.000
roughness	n	n/a	0.05	0.00	0.05	0.00
Open Channel						
Bottom Width	BW	feet	100	0	60	0
Side Slopes (H:1)	H	feet	20	0	10	0
Depth	d	feet	5	0	6	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1000.00	0.00	720.00	0.00
Flow Rate	Q	cfs	5148.18	0.00	4000.94	0.00
Velocity	V	ft/sec	5.15	0.00	5.56	0.00
Travel time	Tt	hours	0.583	-	0.275	-
Flow Length	L	feet	0.00	0.00	8000.00	0.00
Slope	S	ft/ft	0.000	0.000	0.004	0.000
roughness	n	n/a	0.00	0.00	0.05	0.00
Open Channel						
Bottom Width	BW	feet	0	0	90	0
Side Slopes (H:1)	H	feet	0	0	5	0
Depth	d	feet	0	0	8	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	1040.00	0.00
Flow Rate	Q	cfs	0.00	0.00	6516.43	0.00
Velocity	V	ft/sec	0.00	0.00	6.27	0.00
Travel time	Tt	hours	-	-	0.355	-
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Total Travel Time	TC	hours	1.161	0.727	1.430	1.610
	TC	min.	69.6	43.6	85.8	96.6
Lag Time	TL	hours	0.70	0.44	0.86	0.97
	TL	min.	41.8	26.2	51.5	58.0

Mountain Creek Watershed
TR-55 Method of Computing the Time of Concentration
Ultimate Conditions

			NFC-01 (North Fish Creek)	SFC-01 (South Fish Creek)	SFC-02 (South Fish Creek)	SFC-03 (South Fish Creek)
Sheet Flow	variable	units				
Manning's roughness coef.	n	n/a	0.13	0.13	0.13	0.13
Flow Length	L	feet	100	50	300	300
2-year, 24-hour rainfall	P2	inches	4	4	4	4
Slope	s	ft/ft	0.033	0.008	0.027	0.027
Travel time	Tt	hours	0.107	0.108	0.278	0.278
Shallow Concentrated Flow		min.	6.4	6.5	16.7	16.7
Flow Length	L	feet	950	250	250	1,200
Slope	s	ft/ft	0.033	0.008	0.008	0.010
Surface (1=paved or 2=unpaved)		n/a	1	1	1	1
Velocity	V	ft/sec	3.74	1.84	1.84	2.06
Travel time	Tt	hours	0.071	0.038	0.038	0.162
Manning's Equation		min.	4.2	2.3	2.3	9.7
Flow Length	L	feet	15000	24900	15000	8000
Slope	S	ft/ft	0.006	0.004	0.005	0.011
roughness	n	n/a	0.06	0.06	0.05	0.05
Open Channel						
Bottom Width	BW	feet	40	100	60	70
Side Slopes (H:1)	H	feet	50	10	30	10
Depth	d	feet	5	5	5	3
...or Closed Conduit						
Rise / Diameter	R / D	feet	5	5	5	5
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	1450.00	750.00	1050.00	300.00
Flow Rate	Q	cfs	5387.93	2838.65	4515.40	1634.93
Velocity	V	ft/sec	3.72	3.78	4.30	5.45
Travel time	Tt	hours	1.121	1.827	0.969	0.408
Flow Length	L	feet	0.00	0.00	5000.00	14500.00
Slope	S	ft/ft	0.000	0.000	0.004	0.003
roughness	n	n/a	0.00	0.00	0.05	0.05
Open Channel						
Bottom Width	BW	feet	0	0	70	50
Side Slopes (H:1)	H	feet	0	0	10	10
Depth	d	feet	0	0	6	6
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	687.50	660.00
Flow Rate	Q	cfs	0.00	0.00	3159.78	2654.93
Velocity	V	ft/sec	0.00	0.00	4.60	4.02
Travel time	Tt	hours	-	-	0.302	1.001
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Flow Length	L	feet	0.00	0.00	0.00	0.00
Slope	S	ft/ft	0.000	0.000	0.000	0.000
roughness	n	n/a	0.00	0.00	0.00	0.00
Open Channel						
Bottom Width	BW	feet	0	0	0	0
Side Slopes (H:1)	H	feet	0	0	0	0
Depth	d	feet	0	0	0	0
...or Closed Conduit						
Rise / Diameter	R / D	feet	0	0	0	0
Span (0 if circular)	S	feet	0	0	0	0
Cross-Sectional Area	X-A	feet^2	0.00	0.00	0.00	0.00
Flow Rate	Q	cfs	0.00	0.00	0.00	0.00
Velocity	V	ft/sec	0.00	0.00	0.00	0.00
Travel time	Tt	hours	-	-	-	-
Total Travel Time	TC	hours	1.298	1.973	1.587	1.849
	TC	min.	77.9	118.4	95.2	110.9
Lag Time	TL	hours	0.78	1.18	0.95	1.11
	TL	min.	46.7	71.0	57.1	66.6

APPENDIX E
HEC-HMS OUTPUT REPORT

HEC-HMS Basin Layout



EXISTING		100-YR	50-YR	25-YR	10-YR	5-YR	2-YR
Node	DA (sq mi)	Peak Q (cfs)	Peak Q (cfs)	Peak Q (cfs)	Peak Q (cfs)	Peak Q (cfs)	Peak Q (cfs)
AC	2.74	5156.3	4516.4	3862.7	3109	2404.8	1392.4
CC	2.91	4452.9	3913.8	3373.4	2738	2136.5	1268.8
CWC-01	3.97	9001.4	7945.6	6852.9	5588.3	4419.8	2707.5
CWC-02	4.47	8917.1	7939.8	6934.2	5761.9	4665.2	3047.7
CWC Junction-01	10.56	18129.2	15993.2	13827.4	11300.2	8919.4	5465
CWC Junction-02	14.53	20790.2	18206.7	15619.5	12514.1	9537.2	5394.6
CWC Reach-01	10.56	17579.2	15440.9	13324.7	10812.2	8375.3	4825.4
FC-01	2	4165	3658.3	3138	2541.2	1991.3	1203.8
FC-02	1.77	4550	4015	3460.8	2817.2	2227.4	1367.1
Golf Course	78.1	55421.6	47426.7	40457.3	31664.4	24631.5	15236.3
IH-30	79.6	48812	41829.7	35288.3	28289.9	22119.4	13582.7
KC	3.7	7179.3	6334.2	5467.5	4462.7	3521.7	2150.7
KC&FC Junction	26	22770.9	19607.7	16395.5	12680.4	9487.1	5226.1
LMC-01	2.88	4379.4	3830.3	3278.7	2635.3	2027.7	1154.6
LMC-02	1.97	4396.1	3872.5	3331.2	2705.7	2124.5	1276.4
LMC-03	0.93	2043	1811.5	1572.2	1294.2	1034.6	652
LMC-04	1.5	2913.9	2549.4	2177	1750.8	1356.7	796.6
LMC-05	0.6	872.3	757.9	644.2	513.1	391	221.8
MCL Dam	70.92	59709.3	51372.8	43465	34316.6	26421.5	15458.7
MCL Reach	70.92	59709.3	51372.8	43465	34316.6	26421.5	15458.7
N&SFC Junction	20.3	21581.7	18714.9	15742.6	12417.7	9128.8	5334.5
N&SFC Reach	20.3	21129.4	18270.2	15326	11888.5	8924.3	4967.4
NCWC	5.79	10326.9	9116.4	7888.9	6455.3	5104.6	3141.2
NFC-01	3.06	6323.9	5592.5	4838.3	3964.5	3149.2	1955.6
NFC-02	2.58	4584.8	4032.6	3472.9	2820.2	2204	1310.5
NFC Reach-01	3.06	5553.2	4896.9	4230	3413.6	2622.7	1419.1
OC-01	2.94	6964.8	6079.7	5168	4116.9	3152	1766.3
OC-02	3.13	8102.7	7172.5	6206.2	5079	4041.2	2510.5
OC Reach	2.94	6480.2	5612.9	4738.7	3730.1	2781.5	1378.1
Reach-1	70.92	55486.8	48093.9	40296.2	30934.5	23836	14427.5
Reach-2	75.2	54736.9	46840.3	39921.2	31259.3	24320.2	14950
Reach-3	78.1	48599.8	41662.5	35138.5	28177.7	22017.3	13515.3
Reach-4	79.6	48731.4	41738.6	35201.3	28193.9	21898.1	13495.1
Reach-5	0.89	1520.5	1365.6	1211.6	1034.4	850.5	587.8
SCWC	4.77	7873.1	6941.5	6000.7	4899.9	3860.5	2354.4
SFC-01	4.95	7898.5	6974.4	6042.9	4947	3908.2	2394.9
SFC-02	4.73	8584.1	7572.3	6539.2	5336.9	4204.8	2555.6
SFC-03	4.98	7896.8	6930.3	5959.8	4828.3	3759.4	2222.4
SFC Junction	9.68	14611.4	12888.8	11164.8	9085.4	7053.9	4114.2
SFC Reach-01	4.95	7677.5	6780.2	5877	4810.1	3783.2	2302.5
SFC Reach-02	9.68	13557.7	11902.9	10212.5	8194.4	6282.2	3541.4
TB_A Junction	1.4	2218.8	1992.6	1756.5	1462.6	1197	801.5
TB-01	0.51	1792.5	1608.1	1419.9	1188.3	982.1	674.5
TB-02	0.89	2551.6	2281.6	2001.2	1670.4	1368.7	920
TB Junction	75.2	58059.4	50561.8	42474.8	32146.5	24844.5	15566.6
UMC-01	1.86	3913.3	3452.8	2977.8	2427.4	1912.9	1159.1
UMC-02	4.21	8383.4	7344.6	6277.1	5046.3	3896.8	2233.5
UMC-03	1.59	2203.7	1922.4	1641.8	1312.8	1000.8	553
UMC-04	2.59	6519.3	5726.8	4904.8	3949.2	3066.3	1771.6
UMC-05	2.18	6487	5786.9	5064.6	4204.2	3422.8	2264.3
UMC Junction	6.07	8640.8	7548.2	6442.7	5174.9	3985.3	2279.9
UMC Junction-01	11.57	10520.6	8632.4	6917.5	5183.5	3372	1889.3
UMC Junction-01a	8.98	11412.9	9659.4	7844.5	5860.4	4115.7	2101.9
UMC Junction-03	70.92	67814.3	59221.3	50528.9	40653.5	31309.7	18313.2
UMC Reach-01	1.86	3047.9	2652.6	2267.7	1810.6	1395.4	789.8
UMC Reach-02	6.07	7766	6632.5	5457.2	4251.9	3011.9	1653.8
UMC Reach-03	11.57	10207.5	8466.4	6694.9	5070.4	3278.2	1867.5
UMC Reach-2A	8.98	9949.7	8203.3	6572.6	4941	3183	1809.5
West Fork	80.2	48819.7	41808	35263	28239.6	21936.1	13523

ULTIMATE		100-YR	50-YR	25-YR	10-YR	5-YR	2-YR
Node	DA (sq mi)	Peak Q (cfs)	Peak Q (cfs)	Peak Q (cfs)	Peak Q (cfs)	Peak Q (cfs)	Peak Q (cfs)
AC	2.74	5983.6	5268.9	4531.3	3680.7	2892.2	1747.4
CC	2.91	4813.8	4247.1	3674.4	3004.3	2372.3	1455.6
CWC-01	3.97	9056.6	8003.1	6912.3	5648.6	4479.8	2768.8
CWC-02	4.47	8933.4	7956.8	6951.8	5779.9	4683.7	3066.4
CWC Junction-01	10.56	18720.6	16605.6	14457.2	11941.4	9572.1	6108.1
CWC Junction-02	14.53	21431.3	18846.2	16318.2	13202.4	10367.9	6187.6
CWC Reach-01	10.56	18161.3	16042.5	13937.8	11445.3	9083.8	5561.5
FC-01	2	4165	3658.3	3138	2541.2	1991.3	1203.8
FC-02	1.77	4849.3	4288.9	3710.2	3032.1	2414.2	1510.9
Golf Course	78.1	56814.1	48982.9	42105.3	33209.9	25875.3	16620.2
IH-30	79.6	50071.2	43171.6	36459.3	29456.5	23079.3	14776.2
KC	3.7	7252	6409.7	5545.4	4542.6	3603.7	2232.8
KC&FC Junction	26	23087.4	19949.8	16721.1	13071.7	9740.1	5465.6
LMC-01	2.88	4673	4128.1	3579.3	2934.1	2323.9	1437.2
LMC-02	1.97	4772.4	4216	3638.7	2969.6	2351.4	1445
LMC-03	0.93	2060	1829.2	1590.7	1313.3	1054.6	672.6
LMC-04	1.5	2942	2578.1	2206.1	1779.8	1385.7	824
LMC-05	0.6	976.1	863	749.5	616.7	492.3	313.7
MCL Dam	70.92	61324	53104.6	45212.2	36096.6	28085.3	16912.7
MCL Reach	70.92	61324	53104.6	45212.2	36096.6	28085.3	16912.7
N&SFC Junction	20.3	21863.5	19030.8	16042.2	12750.5	9379.9	5667.4
N&SFC Reach	20.3	21408.8	18569.1	15623.8	12245.4	9173.4	5199.7
NCWC	5.79	10547.8	9343.6	8117.8	6689	5343.3	3378.2
NFC-01	3.06	6348.4	5618	4864.7	3991.7	3177.1	1983.9
NFC-02	2.58	4808.1	4263.7	3707.4	3060.4	2450.6	1557.5
NFC Reach-01	3.06	5575.6	4919.3	4254	3440.5	2648.1	1435.9
OC-01	2.94	7404.3	6500.4	5571.3	4490.7	3503.7	2080.5
OC-02	3.13	8498.6	7572.8	6608.7	5480.6	4447.4	2914.7
OC Reach	2.94	6872.2	5977.6	5105.2	4077	3106.6	1690.8
Reach-1	70.92	56838	49642	42359.5	32391.2	25127.8	15624.3
Reach-2	75.2	56143.3	48401.4	41571.8	32797.5	25571.7	16345.3
Reach-3	78.1	49857	43003.8	36306.6	29342	22978.9	14706.5
Reach-4	79.6	49993.7	43076	36379.6	29361.4	22838.4	14673.3
Reach-5	0.89	1520.5	1365.6	1211.6	1034.4	850.5	587.8
SCWC	4.77	8240.6	7322.2	6392.3	5298.8	4266.8	2755.1
SFC-01	4.95	7927.3	7004.4	6074	4978.8	3940.9	2427.8
SFC-02	4.73	8759.5	7755	6728.4	5531.3	4405.2	2756.2
SFC-03	4.98	7915.6	6949.7	5979.1	4847.8	3779.3	2241.8
SFC Junction	9.68	14777.1	13061.9	11345.5	9274.4	7248.2	4294.5
SFC Reach-01	4.95	7705.5	6809.4	5907.1	4841.2	3815.1	2335.4
SFC Reach-02	9.68	13719.8	12072.8	10395.9	8389.3	6449.1	3725.9
TB_A Junction	1.4	2279.8	2057.1	1824.6	1534.1	1273.3	885.3
TB-01	0.51	1853.5	1672.6	1487.9	1259.7	1058.5	758.3
TB-02	0.89	2551.6	2281.6	2001.2	1670.4	1368.7	920
TB Junction	75.2	59543.3	52239.9	44646	33715.5	26188.7	16786.1
UMC-01	1.86	4105.2	3629.1	3136.5	2565.6	2034.1	1253.7
UMC-02	4.21	8906.3	7819.2	6697.6	5404.1	4200.9	2453.7
UMC-03	1.59	2273.8	1995	1715.7	1387.1	1076.7	628.3
UMC-04	2.59	6807.6	6028.6	5218.9	4274.4	3406.2	2125.7
UMC-05	2.18	6589.1	5894.1	5176.5	4320.5	3545	2393.5
UMC Junction	6.07	9172.7	8030.9	6871.4	5540.7	4296.9	2506.2
UMC Junction-01	11.57	10971.2	9001.1	7269.5	5434.7	3640.1	2247.1
UMC Junction-01a	8.98	11933.5	10062.2	8234.8	6097.5	4345	2212.6
UMC Junction-03	70.92	70713.7	61982.9	53208	43042.9	33544.3	20060.6
UMC Reach-01	1.86	3144	2746	2350.6	1884.4	1456.9	832.5
UMC Reach-02	6.07	8182.9	6972.3	5743.8	4475	3230.2	1763.3
UMC Reach-03	11.57	10698.5	8809.2	7034.1	5338.3	3512.6	1970.1
UMC Reach-2A	8.98	10376.2	8537.8	6899.9	5174.3	3434.5	1902.8
West Fork	80.2	50085.9	43149.6	36446.5	29411.6	22879.2	14707.7

APPENDIX F
HEC-RAS OUTPUT REPORT

Summary of Project:
Project: MC_final.prj
Project Title: Mountain_Creek_FINAL_20071214
Project Directory: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\

Project Plans

Plan (current)
Title: **1% Existing - PILOT**
Short ID: 1% EX Unstea
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p09
Geometry:
Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 1% Balanced Existing
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u12

Plan
Title: **1% ULTIMATE - PILOT**
Short ID: 1% Ultimate
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p23
Geometry:
Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 1% Balanced ULTIMATE
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u13

Plan
Title: **1% - PILOT ALT 5**
Short ID: 1% ALT 5
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p22
Geometry:
Title: 09/18/07 Mountain Creek - ALT 3
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g10
Unsteady:
Title: 1% Balanced Alt 4 Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u01

Plan
Title: **50% - PILOT ALT 4**
Short ID: 50% ALT 4
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p20
Geometry:

Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 50% Balanced Alt 4 Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u11

Plan
Title: **1% - PILOT ALT 4**
Short ID: 1% ALT 4
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p03
Geometry:
Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 1% Balanced Alt 4 Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u01

Plan
Title: **Existing Steady - Pilot**
Short ID: EX Steady pi
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p06
Geometry:
Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Flow:
Title: Existing Balanced Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.f01

Plan
Title: **Existing Steady**
Short ID: EX Steady
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p04
Geometry:
Title: 09/18/07 Mountain Creek
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g03
Flow:
Title: Existing Balanced Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.f01

Plan
Title: **Ultimate Steady**
Short ID: Ulitmate
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p01
Geometry:

Title: 09/18/07 Mountain Creek
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g03
Flow:
Title: Ultimate Balanced Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.f04

Plan
Title: **4% Existing - PILOT**
Short ID: 4% Balanced
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p10
Geometry:
Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 4% Balanced Existing
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u06

Plan
Title: **50% Existing - PILOT**
Short ID: 50% Balanced
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p07
Geometry:
Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 50% Balanced Existing
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u08

Plan
Title: **GeoRAS Geometry**
Short ID: GeoRAS
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p05
Geometry:
Title: GeoRAS Geometry
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g02
Flow:
Title: Existing Balanced Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.f01

Plan
Title: **2% Existing - PILOT**
Short ID: 2% Balanced
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p08
Geometry:

Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 2% Balanced Existing
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u05

Plan
Title: **10% Existing - PILOT**
Short ID: 10% Balanced
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p11
Geometry:
Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 10% Balanced Existing
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u04

Plan
Title: **20% Existing - PILOT**
Short ID: 20% Balanced
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p12
Geometry:
Title: 09/19/07 Mountain Creek - ALT 2
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g04
Unsteady:
Title: 20% Balanced Existing
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u07

Plan
Title: **10% - PILOT ALT 4**
Short ID: 10% Alt 4
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p02
Geometry:
Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 10% Balanced Alt 4 Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u02

Plan
Title: **2% - PILOT ALT 4**
Short ID: 2% Alt 4
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p14
Geometry:

Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 2% Balanced Alt 4 Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u03

Plan
Title: **20% - PILOT ALT 4**
Short ID: 20% Alt 4
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p18
Geometry:
Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 20% Balanced Alt 4 Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u09

Plan
Title: **4% - PILOT ALT 4**
Short ID: 4% ALT 4
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p19
Geometry:
Title: 09/18/07 Mountain Creek - PILOT
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g09
Unsteady:
Title: 4% Balanced Alt 4 Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.u10

Plan
Title: **Alternative 6 - Steady**
Short ID: ALT 6
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p13
Geometry:
Title: 10/22/07 Mountain Creek - ALT 6
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g05
Flow:
Title: Existing Balanced Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.f01

Plan
Title: **Alternative 1 - Steady**
Short ID: ALT 1
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p15
Geometry:

Title: 09/19/07 Mountain Creek - ALT 1
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g01
Flow:
Title: Existing Balanced Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.f01

Plan
Title: **Alternative 2 - Steady**
Short ID: ALT 2
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p16
Geometry:
Title: 09/19/07 Mountain Creek - ALT 2
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g04
Flow:
Title: Existing Balanced Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.f01

Plan
Title: **Alternative 3 - Steady**
Short ID: ALT 3
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.p17
Geometry:
Title: 09/18/07 Mountain Creek - ALT 3
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.g10
Flow:
Title: Existing Balanced Flows
File: p:\Active\6028 Mountain Creek Flood Protection\H&H\HEC-RAS\Mountain Creek\MC_final.f01

Current Plan Statistics

Number of:

Rivers	1	
Reaches	1	
Cross Sections	31	
User Input XSs		31
Interpolated		0
Culverts	0	
Bridges	6	
Multiple Openings	0	
Inline Structures	0	
Lateral Structures		0
Storage Areas	0	
SA Connections	0	

EFFECTIVE FEMA

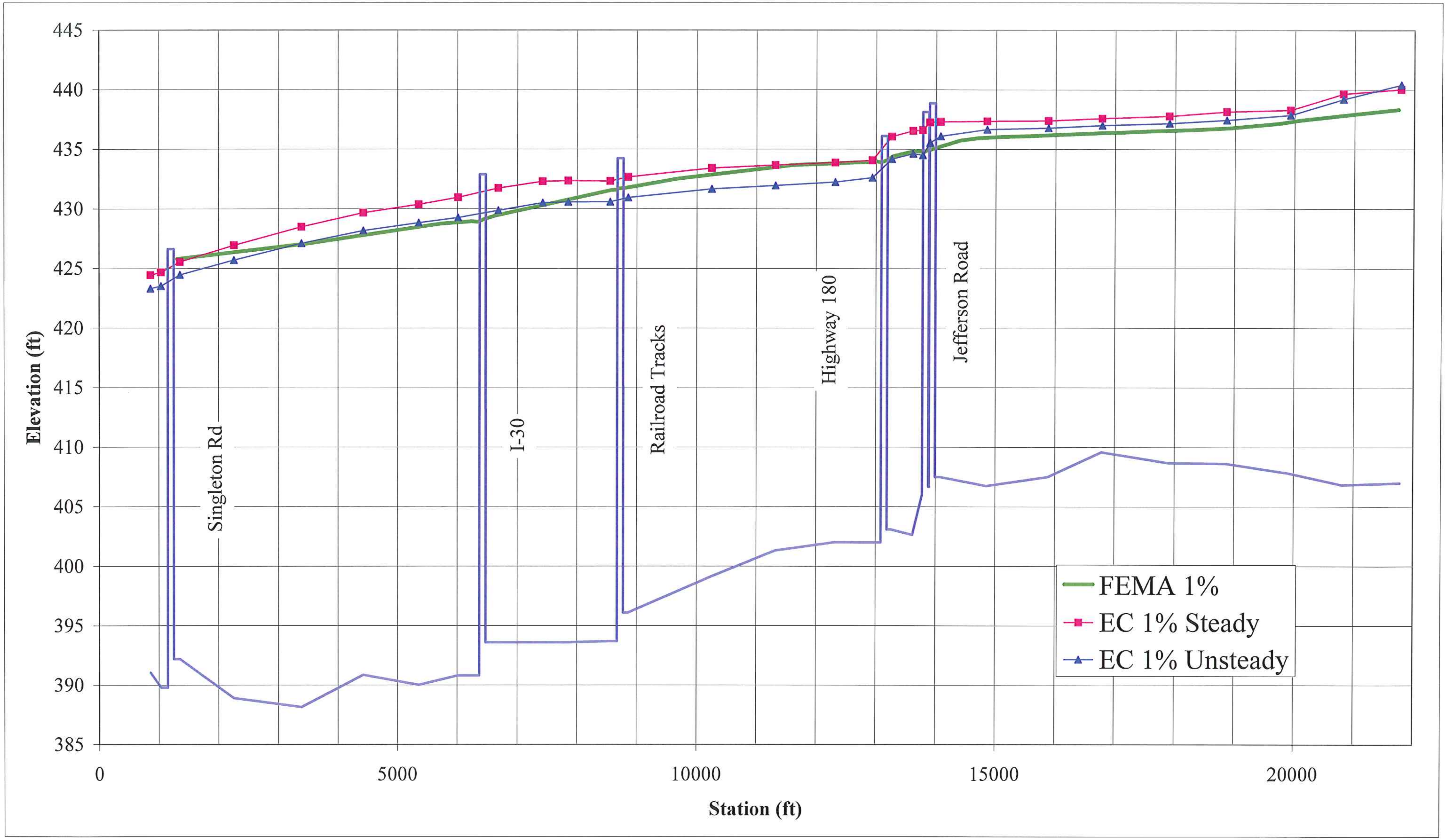
SECNO	Mod. Station	CWSEL (ft)	Q (cfs)	ELMIN (ft)	SSTA (ft)	STCHL (ft)	STCHR (ft)	ENDST (ft)	TOPWID (ft)
1200	1300	425.8	42500	393.5	1050.44	1438	1633	1951.88	901.45
3340	3440	427.06	42500	391.7	1033.13	1414	1546	1963.55	930.42
5620	5720	428.76	42500	392.6	1035.02	1153	1310	2052.05	1017.03
6130	6230	428.95	42500	390.8	10300	10585	10800	11600	1300
6230	6330	428.91	42500	390.5	10326.87	10310	11010	10993.13	641.26
6370	6470	429.19	42500	390.5	10326.24	10310	11010	10993.76	642.51
6520	6620	429.43	42500	390.8	10168	10585	10800	11133	965
8470	8570	431.59	42500	397.2	9345	10000	10600	10635	1290
8545	8645	431.6	42500	401.7	9399.19	10180	10580	10555.51	1062.33
8595	8695	431.71	42500	401.7	9398.72	10180	10580	10556.12	1063.4
8670	8770	431.73	48400	398.4	9425.85	10352	10565	10623.82	1197.97
9590	9690	432.54	48400	400.1	9230	9660	9917	9959.03	729.03
11510	11610	433.69	48400	403	2030	5750	6390	6340.43	4310.43
12000	12100	433.78	48400	408	923.53	5520	6080	6561.45	5637.93
12600	12700	433.91	48100	404.5	952.98	6775	7190	7575	3377.02
12750	12850	433.94	48100	404.5	734.19	6720	7240	7450	2234.84
12900	13000	433.99	48100	404.6	20	6830	7050	7339.93	2079.93
12975	13075	433.91	48100	405	1408.64	7610	8110	8103.31	963.43
13075	13175	434.09	48100	405	1408.04	7610	8110	8103.78	966.54
13175	13275	434.42	48100	404.5	660	6815	7075	7375	1604.42
13415	13515	434.72	48100	405	750	6940	7260	7270	2655
13555	13655	434.84	48100	405	750	6940	7260	7270	3524.43
13700	13800	434.79	48100	406.7	3054.96	8850	9390	9390	1036.03
13740	13840	434.9	48100	406.7	3054.86	8850	9390	9390	1037.13
13790	13890	434.95	48100	410	775	6640	7280	7250	1385
13840	13940	435.05	48100	410	775	6640	7280	7250	1375
14300	14400	435.75	48100	410	980	6720	7295	7343.09	1838.09
14600	14700	435.95	48100	407	8.09	6700	7270	7279.76	4051.67
15000	15100	436.06	48100	408	102.39	6500	7330	7370.31	5837.91
15590	15690	436.15	48100	409	254.29	6840	7120	7652.21	6587.92
15680	15780	436.17	48100	409	253.6	6840	7120	7652.48	6798.88
16680	16780	436.39	48100	410	2134.87	7860	8130	8804.17	6669.3
17040	17140	436.44	48100	410	2099.92	7650	8060	8602.31	6502.39
17440	17540	436.53	48100	410	927.37	6620	7060	7586.1	6658.74
18150	18250	436.63	59300	411	1742.99	6800	7300	8218.97	6475.98
18640	18740	436.76	59300	412	854.38	5930	6600	7652.31	6797.93
18700	18800	436.77	59300	412	1550	6930	7545	8671.03	7121.03
18840	18940	436.8	59300	412	1550	6860	7280	8584.27	7034.27
19640	19740	437.19	59300	412	1520.48	5800	6300	6977.42	5456.94
19940	20040	437.42	59300	410	2847.39	6690	7150	7976.73	5129.34
20240	20340	437.59	59300	412	2898.61	6880	7210	7784.16	4885.55
20940	21040	437.99	59300	411	3605.24	6830	7060	7689.53	4084.29
21630	21730	438.36	58300	410	6770	6770	7320	7345	575

1% Steady Existing

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	21776	59710	407	440.05	422.37	440.21	0.000279	3.99	32173.59	3909.43	0.14
1	20811	59710	406.85	439.67	433.52	439.85	0.000658	4.99	32196.28	5212.82	0.2
1	19927	59710	407.82	438.3	427.5	439.05	0.001413	7.38	10864.28	5266.02	0.29
1	18858	59710	408.63	438.16	426.95	438.27	0.00034	3.66	41900.78	6673.31	0.14
1	17900	59710	408.69	437.79	424.76	437.86	0.000254	3.17	48222.24	7151.81	0.12
1	16778	59710	409.59	437.6	427.03	437.67	0.000264	3.18	46700.62	7042.24	0.13
1	15876	58060	407.5	437.4	426.69	437.46	0.000227	3.08	50890.95	7576.41	0.12
1	14853	58060	406.76	437.36	421.86	437.38	0.000112	1.65	67192.05	8123.56	0.07
1	14073	58060	407.5	437.32	426.7	437.35	0.000131	2.55	65064.36	8348.1	0.09
1	13899	58060	406.7	437.27	427.83	437.3	0.000149	2.61	63368.98	8445.54	0.09
1	13894	58060	406.7	437.27	427.8	437.3	0.000146	2.39	62896.21	8445.33	0.09
1	13776	58060	406	436.61	429.43	436.69	0.000467	3.93	33658.33	7309.19	0.14
1	13618	58060	402.65	436.55	429.63	436.63	0.000339	3.89	38525.36	7505.14	0.14
1	13262	58060	403.1	436.07	428.63	436.39	0.000823	6.54	17459.86	7502.43	0.23
1	12935	58060	402	434.07	428.82	434.66	0.001608	8.53	13333.13	7550.87	0.31
1	12317	55420	402.02	433.88	428.41	433.94	0.000373	3.71	41513.2	8039.75	0.15
1	11314	55420	401.32	433.68	421.94	433.71	0.000143	2.39	61390.38	8094.65	0.09
1	10249	55420	399.15	433.43	422.64	433.54	0.000398	3.79	29043.54	5069.38	0.15
1	8852	48810	396.1	432.68	420.8	432.92	0.000498	4.96	16399.67	4162.88	0.18
1	8554	48810	393.7	432.33	420.07	432.58	0.000481	5.48	16784.43	10026.95	0.18
1	7847	48810	393.6	432.36	421.33	432.38	0.000088	2.15	61995.75	9393.78	0.07
1	7420	48810	393.6	432.31	415.95	432.33	0.000083	2.08	58352.68	8117.42	0.07
1	6679	48820	393.6	431.74	421.55	432.12	0.000822	6.13	12869.33	7029.6	0.22
1	6008	48820	390.81	430.97	413.95	431.23	0.00042	5.07	15518.86	1245.26	0.17
1	5354	48820	390.03	430.38	415.72	430.85	0.000744	6.39	11985.11	945.14	0.22
1	4423	48820	390.87	429.68	419.78	430.1	0.000844	6.29	12156.43	925.63	0.23
1	3386	48820	388.16	428.5	419.87	429.07	0.001133	7.5	10859.18	916.01	0.26
1	2260	48820	388.9	426.94	415.62	427.68	0.001331	7.63	9361.26	902.54	0.28
1	1356	48820	392.2	425.55	415.61	426.35	0.001616	8.01	8957.7	882.7	0.31
1	1038	48820	389.8	424.67		425.58	0.001829	8.69	9016.23	1036.58	0.33
1	863	48820	391.05	424.44	418.68	425.15	0.002002	8.16	10214.41	1286.86	0.33

1% Unsteady Existing MAX WSEL

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	21776	58222.64	407	440.44		440.58	0.000241	3.74	33699.18	3990.77	0.13
1	20811	56787.91	406.85	439.22		440.01	0.001856	8.25	11416.26	5093.37	0.33
1	19927	51280.89	407.82	437.89		438.49	0.001146	6.56	10356.26	5187.99	0.26
1	18858	48857.73	408.63	437.47		437.57	0.000297	3.35	37357.95	6577.85	0.13
1	17900	48069.7	408.69	437.19		437.25	0.000205	2.8	43949.07	7044.2	0.11
1	16778	48658.9	409.59	437.02		437.08	0.000218	2.83	42659.77	6976.99	0.11
1	15876	48455.43	407.5	436.79		436.89	0.00031	3.53	31040.72	7550.31	0.14
1	14853	48404.49	406.76	436.68		436.72	0.000149	1.88	42229.34	8082.68	0.08
1	14073	48377.76	407.5	436.11	424.9	436.76	0.00117	7.37	9825.2	8250.02	0.27
1	13899	48371.89	406.7	435.57		436.19	0.001244	7.19	9980.76	8169.91	0.27
1	13894	48366.3	406.7	435.55	424.8	436.19	0.001203	7.27	9903.19	8167.59	0.27
1	13776	48314.85	406	434.51		435.42	0.002808	9.1	7881.2	6808.28	0.33
1	13618	48319.88	402.65	434.64		434.76	0.000528	4.58	28775.92	7023.76	0.18
1	13262	48881.13	403.1	434.19	427.7	434.53	0.000929	6.6	14816.33	7207.66	0.24
1	12935	42678.2	402	432.63		433.09	0.001285	7.31	11519.8	7403.21	0.28
1	12317	41796.53	402.02	432.25		432.34	0.00046	3.9	31378.84	7819.81	0.16
1	11314	41456.35	401.32	431.96		432	0.000168	2.44	43034.14	7859.65	0.1
1	10249	41157.44	399.15	431.68		431.8	0.000414	3.63	22821.23	4121.9	0.15
1	8852	40671.76	396.1	430.95	418.54	431.18	0.000511	4.78	14243.41	3023.19	0.18
1	8554	40402.33	393.7	430.6		430.84	0.000481	5.27	14645.23	9643.82	0.18
1	7847	40397.71	393.6	430.58		430.6	0.000092	2.09	47926.41	9058.31	0.07
1	7420	40608.93	393.6	430.52		430.55	0.0001	2.18	45554.29	7194.71	0.08
1	6679	40579.2	393.6	429.88	418.86	430.26	0.000881	6.01	10948.35	6557.11	0.23
1	6008	40575.51	390.81	429.27		429.51	0.000394	4.72	13822.17	1224.35	0.16
1	5354	40568.72	390.03	428.84		429.27	0.000699	5.95	10543.36	933.04	0.21
1	4423	40664.5	390.87	428.18		428.55	0.000809	5.89	10774.29	914.29	0.22
1	3386	40658.15	388.16	427.11		427.63	0.001069	7.02	9595.01	906.17	0.25
1	2260	40655.45	388.9	425.7		426.36	0.001224	7.05	8252.06	893.78	0.27
1	1356	40654.32	392.2	424.47	413.91	425.16	0.001457	7.33	8007.39	872.09	0.29
1	1038	40654.31	389.8	423.52		424.36	0.001721	8.13	7827.1	1027.56	0.32
1	863	40654.14	391.05	423.31	415.66	424	0.002002	7.83	8765	1276.88	0.33


445
440
435
430
425
420
415
410
405
400
395
390
385
Elevation (ft)
0
5000
10000
15000
20000
Station (ft)
Singleton Rd
I-30
Railroad Tracks
Highway 180
Jefferson Road
FEMA 1%
EC 1% Steady
EC 1% Unsteady

APPENDIX G
MOUNTAIN CREEK LAKE DAM DATA
(PROVIDED BY EXELON CORPORATION)

Exelon Power

Functional Area												
Cono	Crom	Crov	Del	Eddv	FHGS	Lamo	MCS	Penn	PGG	Rich	Sch	Somr
							X					

LEVEL ONE

MOUNTAIN CREEK SPILLWAY OPERATING PROCEDURE

1.0 RESPONSIBILITY

1.1 The General Manager and Plant Manager are the Owners of this procedure.

1.2 The Operations Manager is responsible for the implementation of this procedure.

1.3 The Shift Manager is responsible for performance of steps in this procedure, and may direct any qualified person to perform any task associated with this procedure. This procedure is to be used only as a guide and in NO WAY RELEASES THE OPERATOR OF THE RESPONSIBILITY OF SAFE OPERATION OF THIS EQUIPMENT.

NOTE: Any non-Exelon personnel that contacts the facility regarding information about possible flooding from Mountain Creek Lake, shall have their contact information recorded and this information shall be forwarded to the Plant Manager immediately. If the Plant Manager cannot be reached, contact the General Manager. Under no circumstances will any Exelon employee provide information, regarding potential flooding or its possible impact on the area, to any non-Exelon personnel without the expressed consent of the Mt. Creek plant management.

1.4 The Shift Manager shall maintain continuous monitoring of the lake level, to ensure optimal operation of the spill gates. Optimal lake level is 457.50 feet.

1.5 The Shift Manager shall monitor weather conditions, and Joe Pool Lake release rates, to anticipate changes in the lake level.

2.0 SCOPE

2.1 These procedures describe the steps necessary for safe and reliable operation of spillway gates.

When monthly operation of the gates are performed, operate the gate as stated below:
2.1.1 Gate #1 January and July
2.1.2 Gate #2 February and August
2.1.3 Gate #3 March and September
2.1.4 Gate #4 April and October
2.1.5 Gate #5 May and November
2.1.6 Gate #6 June and December

Report any problems to Shift Manager and submit a Work Request to address the concern.

3.0 Procedure

3.1 Shift Manager will instruct a control room operator to issue a gate order number.
3.2 The control room operator makes entry in the Spillway Lake flows, Releases And Notifications logbook, in the section of Spillway Gate Operation Log. (See attachment #1)
3.3 Contact two operators to go down to spillway to execute gate order, give them the gate order number, the gate number to be opened, the amount gate is to be opened; and total gate opening.
3.4 Unlock the spillway house door and enter in logbook the gate order number, gate to be opened, amount to be opened, and total opening. (See attachment #2)

3.5 The power cabinet for the gate and log hoist control is located on the south wall. The breaker, labeled bus #2, needs be placed in the ON position to feed power to the gate controllers. The breaker, labeled bus #1, is only for the emergency generator.

3.6 Sound horn three times for a total of 15 seconds.

Note: When going out to operate gates, watch your step, look out for snakes, wasps, etc. that may be hiding under gate motor covers.

3.7 Go to the gate to be opened and unlock the breaker to operate gate motor. Lift breaker handle to close breaker.
3.8 Open gate to requested opening, which is indicated by a height indicator located north of motor - at water level.
3.9 After reaching the requested opening, stop motor and open breaker by pulling breaker handle down and lock it out.
3.10 Return to spillway house and open breaker #2.
3.11 Notify Control Room then log execution and reported times (See attachment #2)
3.12 Make sure spillway house door is locked before leaving area.

3.13 The control room operator will fill out the Lake Release Notification Log, and make all appropriate calls. (See attachment #3)

Note: Calls are to be made with every gate order.

3.14 Change message on recorder for spillway information in Shift manager's office, for total gate opening, and current lake level.

4.0 Telemarker Operations

4.1 Call telemarker number 214-337-7889 add 400 to the measurement to obtain height gauge reading. (See attachment #4)
4.2 If there is no answer you will have to obtain the reading manually down at the telemark.
4.3 Take key #46 from the key box in the shift manager's office, take two trucks when going down to telemark to shield against traffic.
4.4 When taking wire gauge reading, located down at the Westbound Jefferson Street bridge on the south side of bridge half way across the bridge, you will see a little metal box.
4.5 Using key #46, open the box and check the reading on wire gauge, it should be set at 37 feet at start.
4.6 A wire plum bob is in the box; lift locking mechanism to lower plum bob down to the water.
4.7 When the tip of the plum bob makes contact with the top of the water, take the reading.
4.8 Add 404.31 to this reading to obtain a height gauge reading. (See attachment #4)
4.9 Retract the wire plum bob. Secure with the locking mechanism. Close and lock metal box.

5.0 Attachments

5.1 Attachment 1 - Spillway Lake flows, Releases and Notifications Logbook
5.2 Attachment 2 – Control Room Log
5.3 Attachment 3 – Lake Release Notification Log
5.4 Attachment 4 – Telemarker Instructions
5.5 Attachment 5 – Spillway Gate Operations Checklist

DEVELOPMENT HISTORY

Revision 0	Date 04/20/2006
Writer	Bennie Oliver And Phil Burda
Reviewer(s)	Phil Howard, Kenneth Jackson and Thomas Reynolds
Approver(s)	Gerome Randle and Randy Tipton
Reason Written	Spillway Gate Operations

Revision 1	Date x/x/x/x/
Writer	
Reviewer(s)	
Approver(s)	
Reason for Change	

Revision 2	Date
Writer	
Reviewer(s)	
Approver(s)	
Reason for Change	

Revision 3	Date
Writer	
Reviewer(s)	
Approver(s)	
Reason for Change	

Revision 4	Date
Writer	
Reviewer(s)	
Approver(s)	
Reason for Change	

MOUNTAIN CREEK LAKE
WATCH ENGINEER SPILLWAY GATE OPERATION RECORD

				NO. 1		NO. 2		NO. 3		NO. 4		NO. 5		NO. 6				
DATE	TIME	ORDER NO.	OPER.	OPEN FT	TOTAL FT	OPEN FT	TOTAL FT	OPEN FT	TOTAL FT	OPEN FT	TOTAL FT	OPEN FT	TOTAL FT	OPEN FT	TOTAL FT	TOTAL GATE OPENINGS	TOTAL FLOW (AC-FT/HR)	TIME EXECUTED

MOUNTAIN CREEK LAKE	MOUNTAIN CREEK LAKE
SPILLWAY GATE OPERATION ORDER	SPILLWAY GATE OPERATION ORDER
ORDER NO.: ______	ORDER NO.: ______
DATE: ______	DATE: ______
TIME ORDER ISSUED: ______	TIME ORDER ISSUED: ______
PRODUCTION SUPERVISOR: ______	PRODUCTION SUPERVISOR: ______
OPERATOR: ______	OPERATOR: ______
#1 GATE: ______ GATE OPENING (ft.): ______	#1 GATE: ______ GATE OPENING (ft.): ______
#2 GATE: ______ GATE OPENING (ft.): ______	#2 GATE: ______ GATE OPENING (ft.): ______
#3 GATE: ______ GATE OPENING (ft.): ______	#3 GATE: ______ GATE OPENING (ft.): ______
#4 GATE: ______ GATE OPENING (ft.): ______	#4 GATE: ______ GATE OPENING (ft.): ______
#5 GATE: ______ GATE OPENING (ft.): ______	#5 GATE: ______ GATE OPENING (ft.): ______
#6 GATE: ______ GATE OPENING (ft.): ______	#6 GATE: ______ GATE OPENING (ft.): ______
TOTAL OPEN (ft.): ______	**TOTAL OPEN (ft.):** ______
TIME EXECUTED: ______ EXECUTED BY: ______	TIME EXECUTED: ______ EXECUTED BY: ______
REPORT EXECUTED: ______	REPORT EXECUTED: ______

ATTACHMENT 2

Telephone Statement:

I'm calling from Mt. Creek Steam Electric Station

At________(A.M.) (P.M.), the spillway gate(s) were (Opened) (Closed) to a ___________ft. total opening. The current lake level is:______________, discharging_____________CFS

CALL THE FOLLOWING AFTER ALL GATE OPERATIONS:

Wastewater Treatment Plant (214) 670-7401			
Corps of Engineers 0730 to 1645 Ft. Worth - (817) 886-1551 *LEAVE LAKE LEVEL ON RECORDING* CF/SEC			
Weather Bureau 1645 to 0730 Ft. Worth - (800) 792-2257 *LEAVE DISCHARGE AMT ON RECORDING* CS/SEC			
U.S. Geological Survey 0800 to 1645 (after 1645, call ASAP next day) Judy Donahue (817) 263-9545, ext 205			

AC FT/HR TO CFS
(FLOW x 43560 DIV. BY 60) DIV. BY 60 = CU FT/SEC

Date:	________	________	________
Lake Level :	________	________	________
Time Order Executed:	________	________	________
Gate Order Number:	________	________	________
Total Opening:	________	________	________
Cu Ft/Sec:	________	________	________
Operators:	________	________	________

When the downstream telemarker (337-7889) is rising towards the 420 mark, (first action mark is 426), also call the following initially, and for each change of gate opening thereafter.

Randy Tipton Cell (214) 649-7509

Grand Prairie Emergency Operations Manager Office (972)237-7593 , Cell (817) 781-0215
Grand Prairie Fire Chief (*call may be recorded*) Office (972) 237-8301 , Cell (214) 533-3386
Grand Prairie Police Chief Office (972) 237-8710
Dallas Police 911 or (214) 670-7470 SW Sub & (214) 744-4444 (for barricades)
Dallas County Sheriff 24 hr. phone number: (214) 749-8641

CITY OF GRAND PRAIRIE

EMERGENCY RESPONSE GUIDE TO

MOUNTAIN CREEK FLOODING

RESPONSE GUIDE	MSL ELEV.	DESCRIPTION
*MONITOR ALL FLOODED AREAS FOR PUBLIC SAFETY	436.0	100 YR FLOOD AT E. JEFFERSON
*MONITOR ALL FLOODED AREAS FOR PUBLIC SAFETY	434.0	ALL BUILDINGS THAT ARE IN THE GENERAL AREA OF THE CREEK ARE FLOODED
*ADVISE EXTENT OF FLOODING, CALL FOR FIRE DEPT. TO EVACUATE PERSONS	430.0	GROUNDS AT WILLOW BEND MOBILE HOME PARK ARE ALMOST TOTALLY COVERED (LAST CHANCE TO DRIVE CARS OUT OF PARK. DITCHES ARE FULL, JEFFERSON IS FLOODED).
*ADVISE EXTENT OF FLOODING IN THE FLOOD PRONE AREAS ADJACENT TO THE CREEK FLOOD WAY	429.0	EASTBOUND LANE OF E. JEFFERSON FROM 1000' EAST OF IDLEWILD IS GENERALLY IMPASSABLE. SOME BUILDINGS ARE BEGINNING TO FLOOD – 2 OR 3 BUILDINGS
	428.0	OLD MOUNTAIN CREEK IS OUT OF THE CHANNEL
*GRAND PRAIRIE COMMUNICATION TO NOTIFY DALLAS CO. OF FLOODING ON E. JEFFERSON, BARRICADES REQUIRED AT IDLEWILD ST. AND E. JEFFERSON	427.0	EASTBOUND LANE OF E. JEFFERSON IS FLOODING, SUNSET GOLF COURSE 50% FLOODED
*NOTIFY EOC AND/OR COMM CTR OF THIS ELEVATION WHEN WATER REACHES THIS HEIGHT	426.0	OLD CHANNEL FILLED
*TAKE IMMEDIATE READING ON ARRIVAL – USE WIRE GAUGE		____WATER LEVEL / TIME:_____(WIRE) ____WATER LEVEL / TIME:_____(LARC)
	404.31 ZERO FLOW	

**WHEN TAKING WIRE GAUGE READING ADD 404.31 TO READING TO OBTAIN HEIGHT GAUGE READING.

**WHEN TAKING LARC READING (EXELON EQUIPMENT) ADD 400 TO THE MEASUREMENT TO OBTAIN HEIGHT GAUGE READING.

Date_____________ Operators Initials_______________________ Day_____ Night_____

All Control Room Operators review and sign

Spillway Gate Operations Checklist

Time/Initials

_______ 1. Shift manager will instruct control room operator to issue a gate order number.

_______ 2. The control room operator makes entry in spillway lake flows, releases and notifications logbook, in the section of the spillway gate operations log (see attachment #1).

_______ 3. Contact two operators to go down to spillway to execute gate order. Give gate order number, the gate number to be opened, the amount gate is to be opened, and total gate opening.

_______ 4. Unlock spillway gate house door, enter in logbook gate order number, gate to be opened, amount to be opened, and total opening. (See attachment #2)

_______ 5. The power cabinet for gate and log hoist control is located on south wall. The breaker labeled buss #2 needs be placed in "on" position to feed power to gate controllers.

Note: Breaker labeled buss #1 is only for the emergency generator.

_______ 6. Sound horn three times for a total of 15 seconds.

Note: When going out to operate gate watch your step, look out for snakes, wasps, bees, etc. that could be hiding under the gate motor covers.

_______ 7. Go to gate to be opened and unlock breaker to operate gate motor. Lift breaker handle to close breaker.

_______ 8. Open gate to requested opening, which is indicated by a height indicator located north of motor at water level.

_______ 9. After reaching requested opening stop motor and open breaker by pulling breaker handle down and lock it out.

_______ 10. Return to spillway house and open breaker #2.

_______ 11. Notify Control Room then log execution and reported times (See attachment #2)

_______ 12. Make sure spillway house door is locked before leaving area.

_______13. The control room operator will fill out lake release notification log, and make all appropriate calls. (See attachment #3).

_______14. Change message on recorder for spillway information in Shift manager office, for total opening, and current lake level.

Telemarker Operations

_______15. Call telemarker number 214-337-7889; add 400 to the measurement to obtain height gauge reading. (See Attachment #4).

_______16. Get key #46 from key box in shift manager's, take two trucks when going down to telemark to shield against traffic.

_______17. Taking wire gauge reading located down at the West bound Jefferson Street Bridge on the south side of bridge half way on the bridge, you will see a little metal box.

_______18. Open box and check reading on wire gauge, it should be set at 37 feet at start.

_______19. A wire plum bob is in box; lift locking mechanism to lower plum bob down to the Water.

_______20. When tip of the plum bob makes contact with water take reading.

_______21. Retract wire plum bob and secure with locking mechanism. Close and lock metal box.

_______22. Return to plant control room.

_______23. Control room operator will add 404.31 to reading to obtain height gauge reading. (See Attachment #4).

FLOW OF WATER THROUGH ONE TAINTER GATE
(TAILWATER AT ELEVATION 431.0 FT. OR LESS)

Flow Through One Gate (Acre-Feet per Hour)

LAKE ELEV. (Ft.) / Gate Opening (Ft.)	454.00	454.50	455.00	455.50	456.00	456.50	457.00	457.50	458.00	458.50	459.00	459.50	460.00	460.50
.75	59.9	60.6	61.3	62.0	62.7	63.3	64.0	64.7	65.3	66.0	66.6	67.3	67.9	68.5
1.00	78.7	79.6	80.6	81.5	82.4	83.3	84.2	85.1	86.0	86.9	87.7	88.6	89.4	90.3
1.25	97.0	98.2	99.3	100.5	101.6	102.7	103.9	105.0	106.1	107.2	108.3	109.4	110.5	111.5
1.50	115.3	116.7	118.1	119.4	120.8	122.1	123.4	124.7	126.0	127.3	128.6	129.8	131.1	132.3
1.75	133.5	135.1	136.7	138.2	139.7	141.2	142.7	144.3	145.8	147.3	148.8	150.3	151.7	153.2
2.00	151.6	153.4	155.2	157.0	158.7	160.5	162.2	163.9	165.5	167.2	168.8	170.5	172.1	173.7
2.25	169.5	171.5	173.5	175.5	177.5	179.4	181.4	183.3	185.2	187.1	188.9	190.8	192.6	194.4
2.50	187.2	189.4	191.7	193.9	196.1	198.2	200.4	202.5	204.6	206.7	208.8	210.8	212.9	214.9
2.75	204.6	207.1	209.6	212.1	214.5	216.9	219.2	221.6	223.9	226.2	228.5	230.7	233.0	235.2
3.00	222.1	224.8	227.5	230.1	232.7	235.3	237.9	240.5	243.0	245.5	248.0	250.5	252.9	255.3
3.25	239.3	242.3	245.2	248.0	250.9	253.7	256.5	259.2	261.9	264.6	267.3	270.0	272.7	275.3
3.50	256.4	259.6	262.7	265.8	268.9	271.9	274.9	277.9	280.8	283.7	286.6	289.5	292.3	295.1
3.75	273.3	276.7	280.1	283.4	286.7	289.9	293.2	296.4	299.5	302.7	305.8	308.8	311.9	314.9
4.00	290.1	293.8	297.3	300.9	304.4	307.9	311.3	314.7	318.1	321.4	324.7	328.0	331.3	334.5
4.25	306.7	310.6	314.4	318.2	322.0	325.7	329.3	332.9	336.5	340.1	343.6	347.1	350.5	354.0
4.50	323.1	327.3	331.3	335.3	339.3	343.3	347.2	351.0	354.8	358.6	362.3	366.0	369.6	373.3
4.75	339.4	343.8	348.1	352.3	356.5	360.7	364.8	368.9	372.9	376.9	380.9	384.8	388.6	392.5
5.00	355.6	360.2	364.7	369.2	373.6	378.0	382.3	386.6	390.9	395.1	399.3	403.4	407.5	411.5
5.25	371.7	376.5	381.2	385.9	390.6	395.1	399.7	404.2	408.7	413.1	417.5	421.9	426.2	430.4
5.50	387.5	392.6	397.6	402.5	407.4	412.2	417.0	421.7	426.4	431.0	435.6	440.2	444.7	449.2
5.75	403.2	408.5	413.8	419.0	424.1	429.1	434.1	439.1	444.0	448.8	453.6	458.3	463.1	467.8
6.00	418.8	424.3	429.8	435.2	440.6	445.9	451.1	456.3	461.4	466.5	471.5	476.5	481.4	486.2
6.25	434.1	440.0	445.7	451.4	457.0	462.5	468.0	473.4	478.7	484.0	489.3	494.5	499.6	504.7
6.50	449.3	455.4	461.4	467.3	473.2	478.9	484.7	490.3	495.9	501.4	506.9	512.3	517.6	522.9
6.75	464.4	470.7	476.9	483.1	489.2	495.2	501.2	507.1	512.9	518.8	524.3	530.0	535.5	541.1
7.00	479.2	485.8	492.3	498.7	505.1	511.4	517.5	523.7	529.7	535.7	541.6	547.5	553.3	559.0
7.25	493.9	500.8	507.5	514.2	520.8	527.3	533.8	540.1	546.4	552.6	558.8	564.9	570.9	576.9
7.50	508.5	515.6	522.6	529.5	536.4	543.1	549.8	556.4	562.9	569.4	575.8	582.1	588.4	594.6
7.75	522.8	530.2	537.5	544.7	551.8	558.8	565.7	572.6	579.3	586.0	592.6	599.2	605.7	612.1
8.00	537.0	544.7	552.2	559.7	567.0	574.3	581.5	588.5	595.6	602.5	609.3	616.1	622.8	629.5
8.25	551.1	559.0	566.8	574.5	582.1	589.6	597.0	604.4	611.6	618.8	625.9	632.9	639.9	646.7
8.50	564.9	573.1	581.2	589.2	597.0	604.8	612.5	620.1	627.6	635.0	642.3	649.6	656.7	663.8
8.75	578.7	587.1	595.4	603.7	611.8	619.8	627.7	635.6	643.3	651.0	658.6	666.0	673.3	680.8
9.00	592.2	600.9	609.5	618.0	626.4	634.7	642.9	650.9	658.9	666.8	674.7	682.4	690.0	697.6
9.25	605.6	614.6	623.4	632.2	640.8	649.4	657.8	666.2	674.4	682.5	690.6	698.6	706.4	714.2
9.5	618.8	628.0	637.2	646.2	655.1	663.9	672.6	681.2	689.7	698.1	706.4	714.6	722.7	730.8
9.75	631.8	641.3	650.8	660.1	669.3	678.3	687.3	696.1	[illegible]	713.5	722.0	730.5	738.9	747.1
10.00	644.7	654.5	664.2	673.8	683.2	692.5	701.8	710.9	719.9	728.7	737.5	746.2	754.8	763.3
10.25	657.4	667.5	677.5	687.3	697.0	706.6	716.1	725.5	734.7	743.8	752.9	761.8	770.7	779.4
10.50	669.9	680.3	690.6	700.7	710.7	720.5	730.3	739.9	749.4	758.8	768.1	777.3	[illegible]	795.3
10.75	682.3	693.0	703.5	713.9	724.2	734.3	744.3	754.2	763.9	773.6	783.1	792.6	801.9	811.1
11.00	694.5	705.5	716.3	727.0	737.5	747.9	758.2	768.3	778.3	788.2	798.0	807.7	817.3	826.7
11.25	706.5	717.8	728.9	739.8	750.7	761.3	771.9	782.3	792.6	802.7	812.8	822.7	832.5	842.2
11.50	718.4	729.9	741.3	752.6	763.7	774.6	785.4	796.1	806.6	817.0	827.3	837.5	847.6	857.5
11.75	730.1	741.9	753.8	765.1	776.5	787.7	798.8	809.7	820.6	831.2	841.8	852.2	862.5	872.7
12.00	741.6	753.8	765.7	777.5	789.2	800.7	812.0	823.3	834.3	845.3	856.1	866.8	877.3	887.8
12.25	753.0	765.4	777.7	789.8	801.7	813.5	825.1	836.6	847.9	859.1	870.2	881.2	892.0	902.7
12.50	764.2	776.9	789.5	801.9	814.1	826.1	838.0	849.8	861.4	872.9	884.2	895.4	906.5	917.4
12.75	775.2	788.3	801.1	813.8	826.3	838.6	850.8	862.8	874.7	886.4	898.0	909.5	920.8	932.0
13.00	786.1	799.4	812.6	825.6	838.3	851.0	863.4	875.7	887.9	899.9	911.7	923.4	935.0	946.5
13.25	796.8	810.4	823.9	837.1	850.2	863.1	875.9	888.4	900.9	913.1	925.2	937.2	949.1	960.8
13.50	807.3	821.3	835.0	848.6	862.0	875.1	888.2	901.0	913.7	926.2	938.6	950.9	963.0	974.9

Data From Exelon for Mountain Crk Dam Discharge

F602-15

MOUNTAIN ... EK LAKE

WATCH ENGINEER SPILLWAY GATE OPERATION RECORD

2006

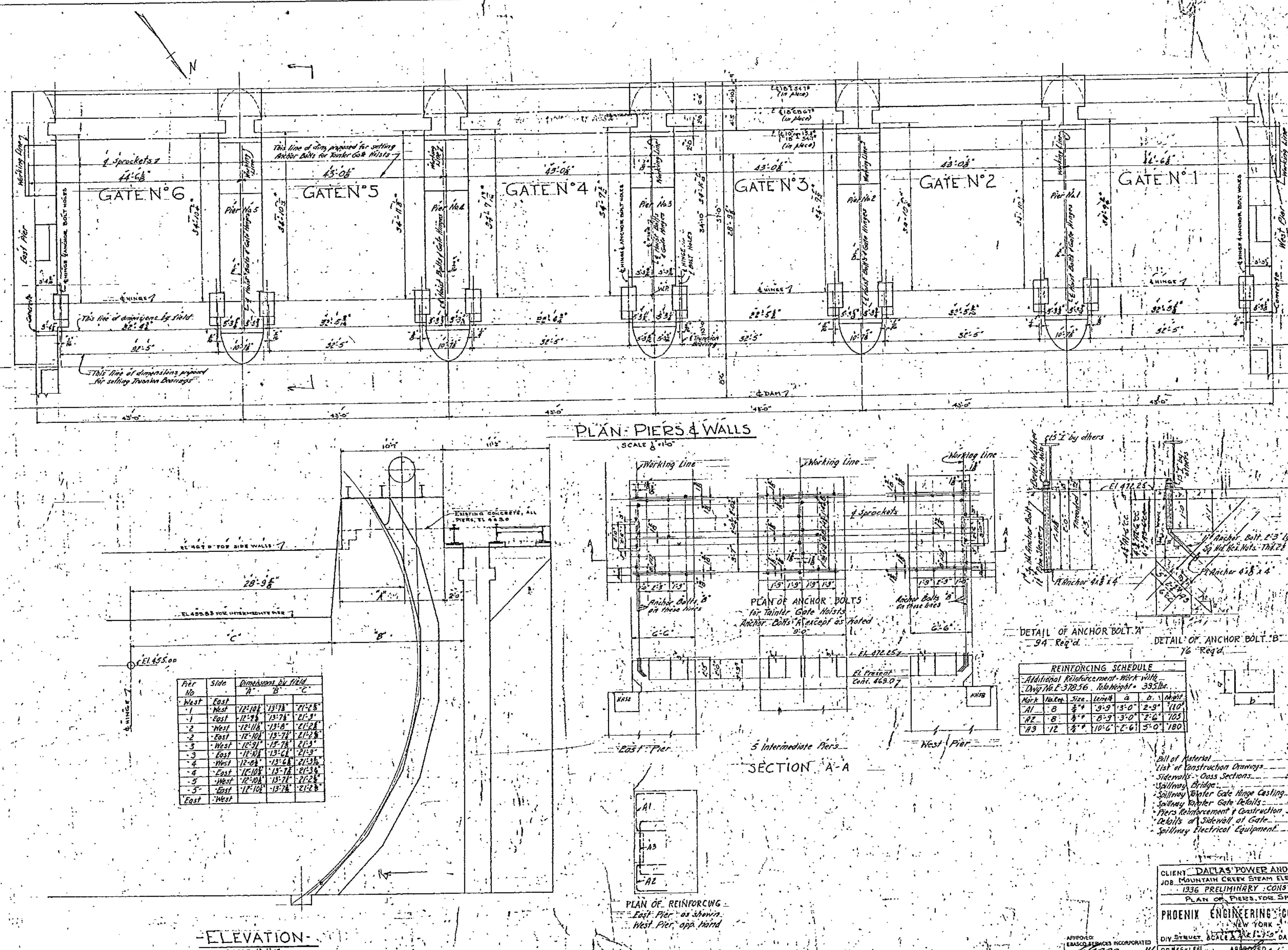
DATE	TIME	ORDER NO.	OPER.	NO. 1 OPEN FT.	NO. 1 TOTAL FT.	NO. 2 OPEN FT.	NO. 2 TOTAL FT.	NO. 3 OPEN FT.	NO. 3 TOTAL FT.	NO. 4 OPEN FT.	NO. 4 TOTAL FT.	NO. 5 OPEN FT.	NO. 5 TOTAL FT.	NO. 6 OPEN FT.	NO. 6 TOTAL FT.	TOTAL GATE OPENINGS	TOTAL FLOW (AC-FT/HR)	TIME EXECUTED
2/25/06	12:39	3028						+1	1FT				(LAKE LEVEL	457.40)		1FT.	85.1AFH / 1029.71CFS	~~[illegible]~~ 15:00
2/25/06	2320	3029	SH/SH					Ø	Ø				(LAKE LEVEL	457.4[illegible])		Ø	Ø	2338
3/8/06	16:15	3030	MB							+1	1FT.			(LAKE LEVEL 457.60)		1FT.	85.1AFH / 1029.71CFS	1631
3/9/06	0350	3031	JK/CG							Ø	Ø					Ø	Ø	0430
3-19-06	0630	3032	[illegible]					2Ft	2Ft					(Lake Level 457.56)		2FT	163.9 AFH / 1983.19 CFS	0650
3-19-06	0845	3033	[illegible]					1Ft	3Ft	3Ft	3Ft			(457.68 Lake Level)		6 Ft	456.3 AFH / 5521.23 CFS	0900
3-19-06	1400	3034	PB/TR					1Ft	4Ft	1Ft	4Ft	4Ft	4Ft	(458.00)		12 Ft	838.4 CFS / 10,096.2 CFS	1430
3-19-06	1500	3035	PB/TR					1Ft	5Ft	1Ft	5Ft	1Ft	5Ft			15 Ft	1,053.50 / 12,7[illegible]	1510
3-19-06	1550	3036	PB/TR			5Ft	5Ft									20Ft	1457.4 / 17,634.54	1555
3-19-06	1640	3037	PB/TR			1Ft	6Ft	1Ft	6Ft	1Ft	6Ft	1Ft	6Ft	458.62		24Ft	1690AFH / 20,449 CFS	1645
3-19-06	1701	3038	PB/TR	3Ft	3Ft									3Ft	3Ft	30Ft	2186 AFH / 26,451.81	1705
3-19-06	1930	3039	SH/MB	-3Ft	0							LAKE LEVEL	458.78			27FT		2012
3-19-06	2030	3040	SH/MB									LAKE LEVEL	457.62	-3Ft	0	24FT		2036
3-19-06	2042	3041	JH/MB			-6Ft	0					LAKE LEVEL	457.50			18FT		2053
3-19-06	2121	3042	SH/MB									-3Ft	3Ft	(457.25)		15FT	1018.1 / 12,319.01	2126
3-19-06	2200	3043	SH/MB									-3Ft	0	(457.23)		12FT	817.65 / 9893.57	2206
3-19-06	2232	3044	SH/MB					-2Ft	4Ft	-2Ft	4Ft			(457.16)		8FT	624 / 7550.4	2244
3-19-06	2307	3045	SH/MB					-4Ft	0							4FT	312.3 / 3778.83	2317
3-19-06	2337	3046	SH/MB							-3Ft	1Ft					1 FT	84.4 / 1021.24	2344

F602-15

MOUNTAIN CREEK LAKE

WATCH ENGINEER SPILLWAY GATE OPERATION RECORD

DATE	TIME	ORDER NO.	OPER.	NO. 1 OPEN FT.	NO. 1 TOTAL FT.	NO. 2 OPEN FT.	NO. 2 TOTAL FT.	NO. 3 OPEN FT.	NO. 3 TOTAL FT.	NO. 4 OPEN FT.	NO. 4 TOTAL FT.	NO. 5 OPEN FT.	NO. 5 TOTAL FT.	NO. 6 OPEN FT.	NO. 6 TOTAL FT.	TOTAL GATE OPENINGS	TOTAL FLOW (AC-FT/HR)	TIME EXECUTED
3/29/06	1200	3047	SE/JH							0	0					0	0	1200
3/23/06	0845	3048	MP/JH							3/4	3/4					3/4	786.5 CFS	0845
3/26/06	1515	3049	HH/BG							-3/4	0					0	0	1536
3/28-06	0700	3050	PB/TR							3/4	3/4					3/4	64.7 CFS 786.5 CFS	0720
3/29/06	1045	3051	PB/ST							-3/4	0					0	0	1105
4/20/06	1550	3052	JH/MP							1	1					1	85.3 1032 CFS	1550
4/20/06	2012	3053	DB/BRD							1'	Ø					Ø	Ø	2040
5/5/06	0408	3054						2'	2'							2'	163.9 1988.8	4:25
5-5-06	1340	3055	MP/JH					3/4	3/4'							3/4'	64.7 786.5	1340
5-5-06	1919	3056	TB/JS					-3/4	0'							0	0	1943
5-6-06	1238	3057	MP/RS							3/4	3/4					3/4	64.8 784	1238
5-7-07	0100	3058	TB/SS							-3/4	0					0	0	0100



Pier No	Side	Dimensions by field "A"	"B"	"C"
West	East			
1	West	12'-10 1/2"	13'-7 1/8"	21'-2 5/8"
1	East	12'-9 1/2"	13'-7 3/8"	21'-3"
2	West	12'-11 1/8"	13'-8"	21'-2 7/8"
2	East	12'-10 1/2"	13'-7 1/4"	21'-2 3/8"
3	West	12'-9 1/2"	13'-7 3/8"	21'-3"
3	East	12'-10 1/8"	13'-6 1/2"	21'-3"
4	West	12'-8 1/2"	13'-6 3/8"	21'-3 1/4"
4	East	12'-10 3/8"	13'-7 1/8"	21'-3 1/4"
5	West	12'-10 1/8"	13'-7 1/2"	21'-2 5/8"
5	East	12'-10 1/2"	13'-7 3/8"	21'-2 7/8"
East	West			

REINFORCING SCHEDULE

Additional Reinforcement - Work with Dwg No. E-37856. Total Weight = 395 lbs.

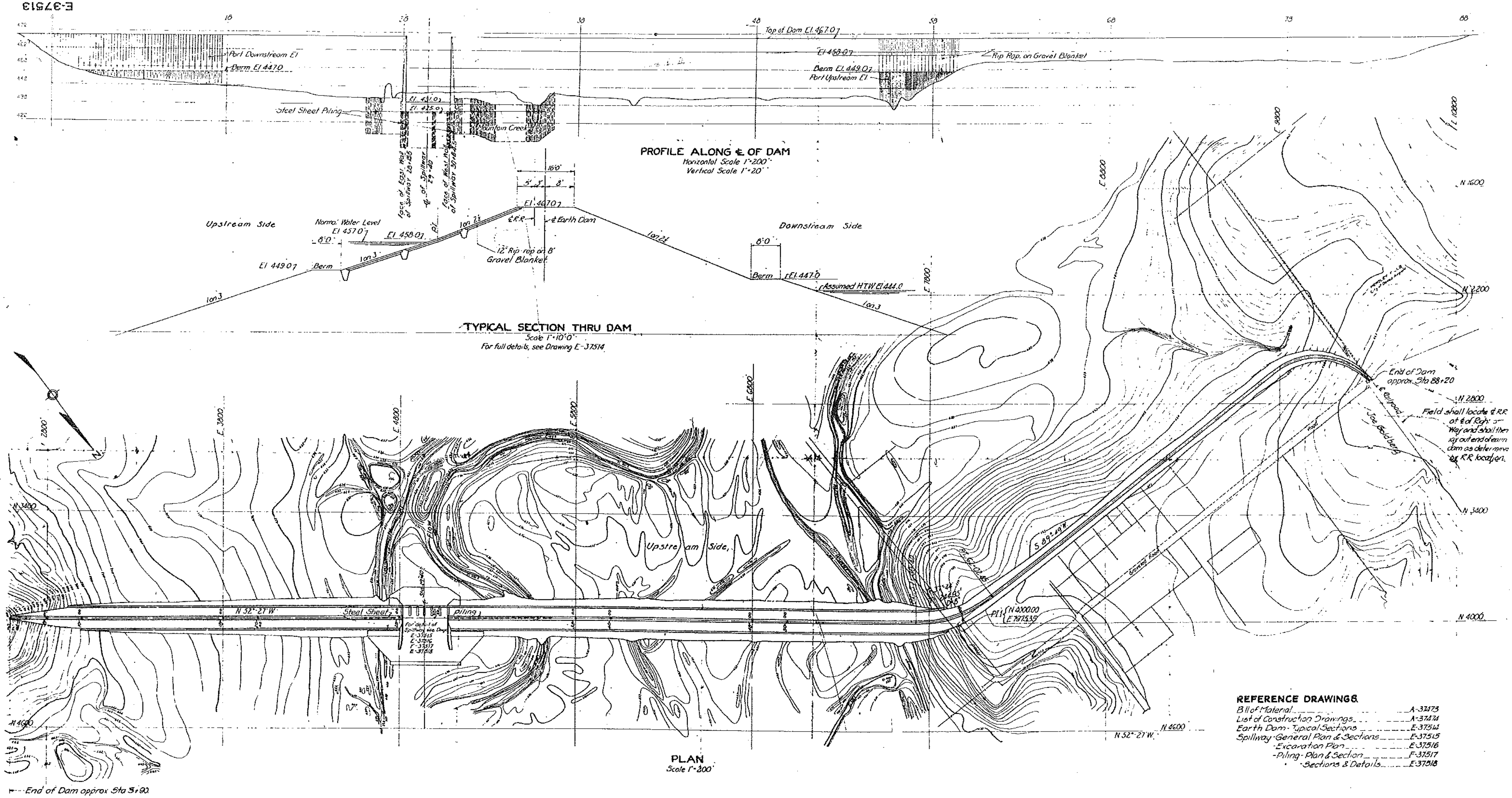
Mark	No. Req.	Size	Length	a	b	Weight
A1	8	3/4" ⌀	9'-9"	3'-0"	2'-9"	110#
A2	8	3/4" ⌀	8'-9"	3'-0"	2'-6"	105
A3	12	3/4" ⌀	10'-6"	2'-6"	5'-0"	180

Bill of Material
List of Construction Drawings
Sidewalls - Cross Sections — E-37856
Spillway Bridge — D-38558
Spillway Tainter Gate Hinge Casting — E-51758
Spillway Tainter Gate Details — D-51759
Piers Reinforcement & Construction Joints — E-51760
Details of Sidewall at Gate — E-51761
Spillway Electrical Equipment — E-38530

APPROVED: EBASCO SERVICES INCORPORATED
By [signature]
By

NO | DATE | REVISION | BY | C. | APP

CLIENT DALLAS POWER AND LIGHT CO.
JOB MOUNTAIN CREEK STEAM ELECTRIC STATION
1936 PRELIMINARY CONSTRUCTION
PLAN OF PIERS FOR SPILLWAY.
PHOENIX ENGINEERING CORPORATION
NEW YORK
DIV. STRUCT. SCALE AS NOTED DATE 11-20-36
DR. NKG-LEK
TR.
CK. E.M.
APPROVED
E-52137



REFERENCE DRAWINGS

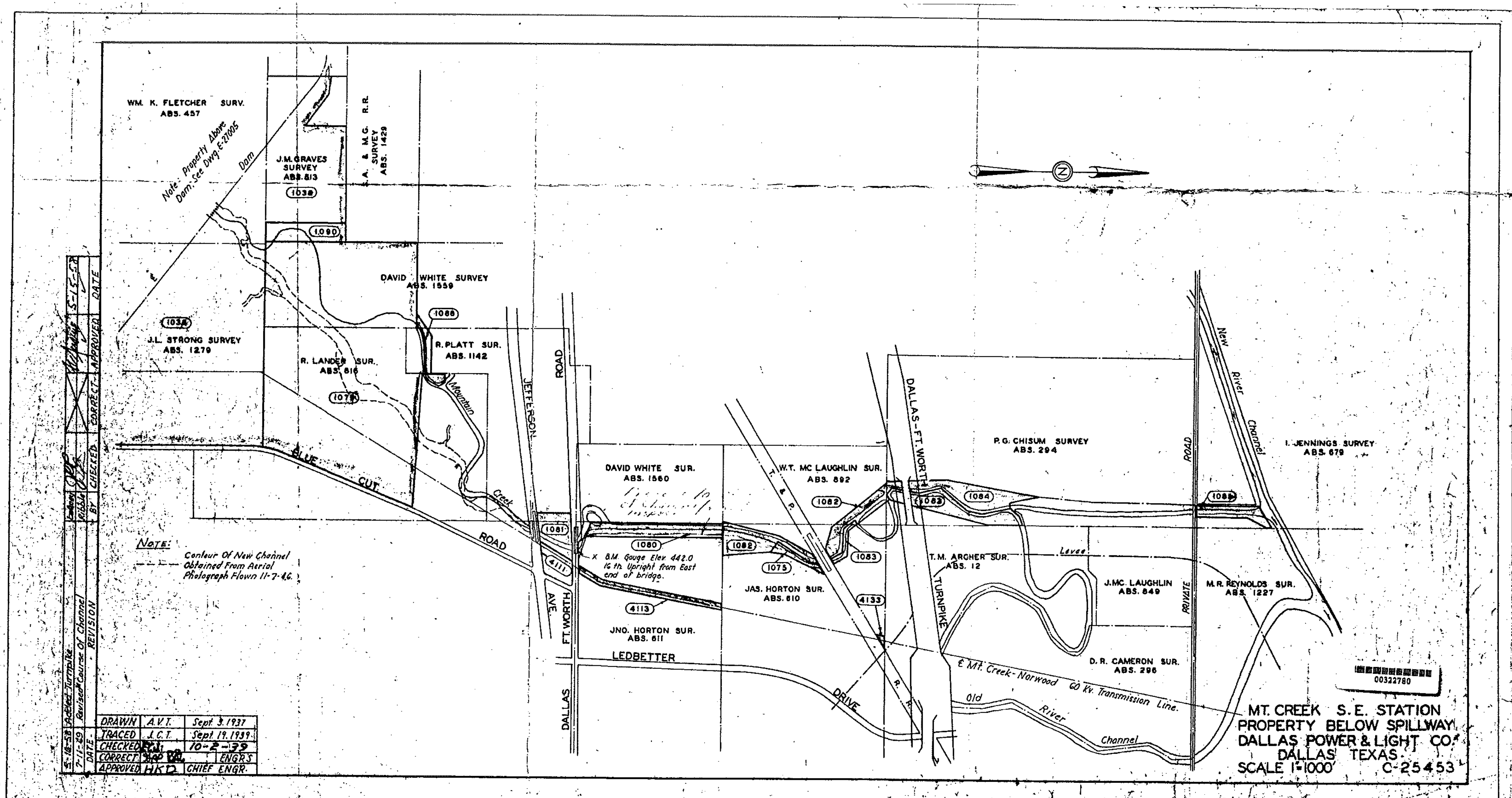
Bill of Material	A-37473
List of Construction Drawings	A-37474
Earth Dam - Typical Sections	E-37514
Spillway - General Plan & Sections	E-37515
- Excavation Plan	E-37516
- Piling - Plan & Section	F-37517
- Sections & Details	E-37518

APPROVED H.E. McDowell

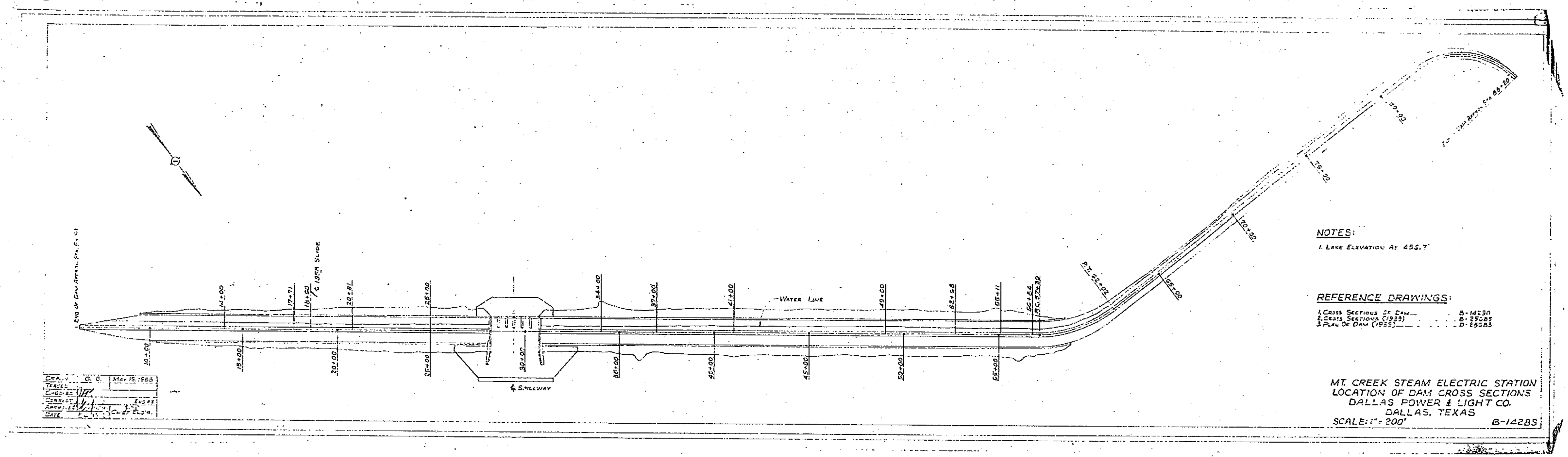
DRAWN BY	W.L.S.
TRACED	
CHECKED	
CORRECT	

1		Type of Upstream Paving Steel Sheet Piling	V.Z.	G.T.P.	
		1931 - 35,000 KW. CONSTRUCTION			
NO.	DATE	REVISION	BY	CH.	APP.

MOUNTAIN CREEK STEAM ELECTRIC STATION
EARTH DAM
GENERAL PLAN & SECTIONS
DALLAS POWER & LIGHT CO.
OCTOBER 15, 1930 SCALE 1" = 200' & AS SHOWN
TEXAS CONSTRUCTION COMPANY
TEXAS
E-37513



WM. K. FLETCHER SURV.
ABS. 457
Note: Property Above
Dam. See Dwg. E-27005
Dam
J.M. GRAVES
SURVEY
ABS. 513
1038
A. & M.G. R.R.
SURVEY
ABS. 1429
1090
DAVID WHITE SURVEY
ABS. 1559
1088
1036
J.L. STRONG SURVEY
ABS. 1279
R. LANDER SUR.
ABS. 816
R. PLATT SUR.
ABS. 1142
1079
Mountain
Creek
BLUE CUT ROAD
JEFFERSON
ROAD
FT. WORTH
AVE.
DALLAS
LEDBETTER
DRIVE
1081
4111
1080
4113
DAVID WHITE SUR.
ABS. 1560
JNO. HORTON SUR.
ABS. 611
X B.M. Gauge Elev. 442.0
16 ft. Upright from East
end of bridge.
NOTE:
Contour Of New Channel
Obtained From Aerial
Photograph Flown 11-7-46
1082
1075
JAS. HORTON SUR.
ABS. 610
W.T. MC LAUGHLIN SUR.
ABS. 892
T. & P. R. R.
1083
4133
DALLAS-FT. WORTH
TURNPIKE
P.G. CHISUM SURVEY
ABS. 294
1084
T.M. ARCHER SUR.
ABS. 12
Levee
J.MC. LAUGHLIN
ABS. 849
D.R. CAMERON SUR.
ABS. 296
ROAD
PRIVATE
1085
New River Channel
I. JENNINGS SURVEY
ABS. 679
M.R. REYNOLDS SUR.
ABS. 1227
℄ Mt. Creek-Norwood 60 Kv. Transmission Line.
Old River Channel
N
00322780
MT. CREEK S.E. STATION
PROPERTY BELOW SPILLWAY
DALLAS POWER & LIGHT CO.
DALLAS TEXAS
SCALE 1"=1000'
C-25453
DRAWN A.V.T. Sept. 3. 1937
TRACED J.C.T. Sept. 19. 1939
CHECKED 10-2-39
CORRECT ENGR'S
APPROVED HKD CHIEF ENGR.
5-18-58 Added Turnpike
7-11-39 Revised Course of Channel
DATE REVISION BY CHECKED CORRECT APPROVED DATE
5-15-58



WATER LINE
℄ SPILLWAY
NOTES:
1. LAKE ELEVATION AT 456.7'
REFERENCE DRAWINGS:
1. CROSS SECTIONS OF DAM — B-14230
2. CROSS SECTIONS (1939) — B-25585
3. PLAN OF DAM (1955) — D-25583
MT. CREEK STEAM ELECTRIC STATION
LOCATION OF DAM CROSS SECTIONS
DALLAS POWER & LIGHT CO.
DALLAS, TEXAS
SCALE: 1"= 200'
B-14285

APPENDIX H
RADAR RAINFALL ANALYSIS
(March 19, 2006 Storm Event)

Radar Rainfall Analysis

Mountain Creek Summary Report

March 19-20th, 2006 Event

Prepared for:
Espey Consultants, Inc.
Dallas Texas

September 29th, 2006

VIEUX, INC.

350 David L. Boren Blvd., Suite 2500
Norman Oklahoma 73072
www.vieuxinc.com

Table of Contents

Overview

The following rainfall event analysis is performed in support of Espey Consultants, Inc. The March 19-20th, 2006 rainfall event over Mountain Creek was processed using Level II NEXRAD data from Ft. Worth, TX (KFWS). The radar rainfall calibration statistics are listed in Table 2 along with the radar and resolution used for analysis. All radar data was processed into 5-minute increments. Hourly rainfall data from ten National Weather Service (NWS) rain gauges located within 50-km of watershed were used to adjust the radar, including six ASOS and four COOP stations. The basin shapefile for Mountain Creek was provided by Espey Consultants, Inc. Sampling the radar over the gauges and basin was achieved using software developed at Vieux, Inc. Figure 1 depicts the spatial distribution of the rain gauge network in relation to Mountain Creek. For the gauges shown in Figure 1, the name and source of each gauge is listed in Table 2.

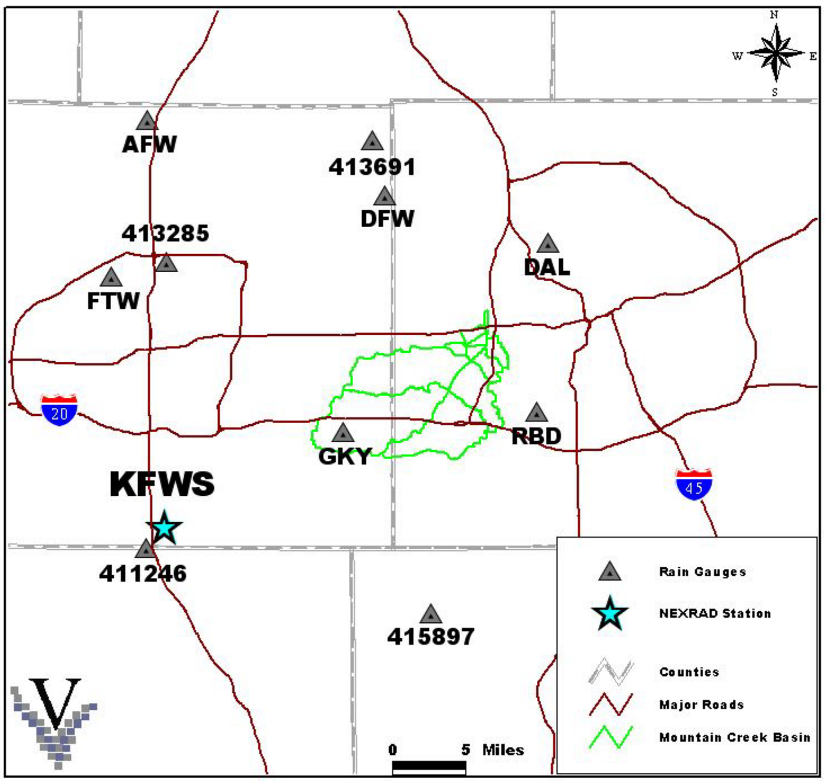


Figure 1 Spatial distribution of the rain gauge network

Level II NEXRAD data is the native resolution of the radar measurements with a polar coordinate system of 1-degree by 1-km. Due to proximity to the radar, KFWS Level II data resolution over Mountain Creek ranges from approximately 0.3 x 1.0-km to 0.75 x 1.0-km.

Table 1 Rain gauge details

Gauge Name	Gauge ID	Source
Burleson	411246	NWS - COOP
Ft. Worth WSFO	413285	NWS - COOP
Grapevine Dam	413691	NWS - COOP
Midlothian 2	415897	NWS - COOP
Ft. Worth Alliance Apt	AFW	NWS - ASOS
Dallas Love Field	DAL	NWS - ASOS
Regional Apt	DFW	NWS - ASOS
Meacham Int'l Apt	FTW	NWS - ASOS
Arlington Municipal Apt	GKY	NWS - ASOS
Redbird Apt	RBD	NWS - ASOS

Methodology

Statistical control of the data processing provides valuable information useful for removing data that is not reliable and for adjusting radar rainfall measurements to be more accurate. Rain gauge measurements compared to radar accumulations over the gauge reveals periods where the gauge over- and under-reported by comparison with radar. By statistical comparison between the radar and rain gauge accumulations during a calibration interval, statistical outliers may be identified. In addition, radar data is enhanced by correcting it for systematic errors called bias. This procedure helps improve the accuracy of the rainfall product. The bias correction factors are multiplicative factors applied to the radar that enhances the accuracy of the radar rainfall for any sample period.

Accuracy of radar rainfall over specific target areas may be enhanced by comparison and adjustment to rain gauge networks. The method of adjustment depends on the hydrologic application and the spatial extent of the area of interest. The local bias (LB) approach to adjusting the radar rainfall uses the ratio of gauge to radar accumulations from surrounding gauges with the closest gauge having the most weight. The LB approach distributes the variation of bias over the region for a given 24-hour period or event.

A Local Bias (LB) method was used for gauge adjustment of the radar. The LB uses the ratio between the sum of each gauge divided by the sum of the sampled radar values over each gauge. All radar/gauge pairs were checked for outliers. The bias of each qualified remaining RG pair was then surfaced over the analysis area using a weighted distance technique. The resulting LB value over each radar bin is the multiplicative factor that adjusts the radar. For example, a bias of 1.5 can be interpreted as a 33% underestimation by the radar. The three parameters used to quantify the LB value are: 1) average difference (AD), 2) calibrated average difference (CAD), and 3) relative dispersion (RD). All three of these parameters are expressed as an absolute percentage about the mean.

At a given location, radar measurement may differ from rain gauge measurement for several reasons. Radar collects data by sampling a relatively large volume of the atmosphere while rain gauges measure at a point. Another source of difference is that radar measures above the ground, while rain gauges measure close to the ground. Additionally, the differences between the radar data and the rain gauge data can be affected by specific storm characteristics and season of the year. By adjusting the radar data with rain gauge data, better maps of rainfall are produced than either sensor system could produce alone.

Results

Table 2 shows the bias for this event along with the average difference, calibrated average difference, and relative dispersion, respectively. The bias is the sum of the gauges divided by the sum of the sampled radar values over the gauges. All available gauges were analyzed to identify and remove outliers. A CAD of 2.9% indicates that the mean adjusted radar rainfall depth agrees with the mean gauge depth to within ±1.5%.

Table 2 Storm events and bias statistics

Radar	Data Level	TILT	Event Date	Gauges Used	Bias	AD (%)	CAD (%)	RD (%)
KFWS	II	2	3/19/06	8 of 10	2.484	60.1	2.9	3.7

Discussion

The radar rainfall event analysis period was from 3/18/06 23:00 CST to 3/20/06 4:00 CST (3/19/06 5:00 UTC to 3/20/06 10:00 UTC). Gauges 411246 and 413691 either performed poorly or they were considered suspect and were excluded from analysis. No outliers were identified during this event. The convective Z-R relationship was used to convert radar reflectivity to rainfall rate. Table 3 summarizes the results for each RG pair used for final radar adjustment, where G_i is the gauge estimate, R_i is the non-adjusted radar estimate, Ri* is the adjusted radar estimate, Diff* (in) is the difference in inches between the gauge and adjusted radar estimate, and Diff* (%) is the percent difference between the gauge and adjusted radar estimate. Figure 2 depicts the gauge-adjusted radar storm total for this event. Figure 3 shows the scatter plot of the calibrated RG pairs.

Table 3 Summary of individual RG pairs

Gauge Name	Gauge ID	G_i	R_i	R_i*	Diff* (in)	Diff* (%)
Redbird Apt	RBD	4.52	2.05	4.74	-0.22	-4.9
Regional Apt	DFW	3.44	1.52	3.57	-0.13	-3.7
Meacham Int'l Apt	FTW	3.06	1.20	3.16	-0.10	-3.4
Midlothian 2	415897	3.70	1.46	3.72	-0.02	-0.5
Ft. Worth WSFO	413285	3.20	1.20	3.18	0.02	0.5
Dallas Love Field	DAL	6.90	2.98	6.84	0.06	0.8
Ft. Worth Alliance Apt	AFW	2.12	0.74	2.03	0.09	4.4
Arlington Municipal Apt	GKY	6.08	2.15	5.76	0.32	5.3

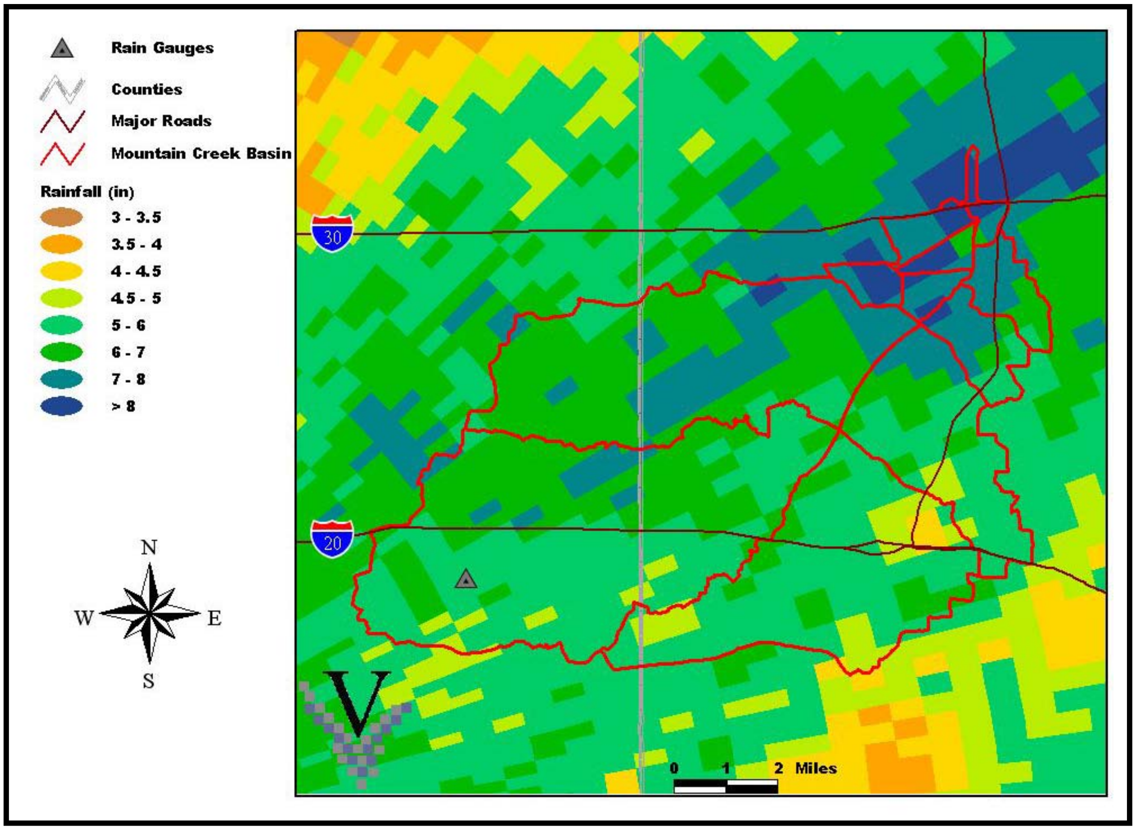


Figure 2 Gauge-adjusted radar storm total and radar bin values

The gauge-adjusted radar rainfall amounts for the 12 subbasins that comprise the Mountain Creek basin range from 5.5 – 8.2 inches with a mean of 7.1 inches.

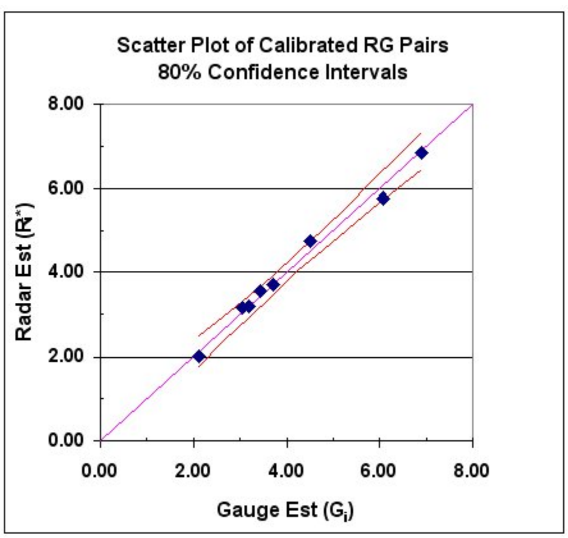


Figure 3 Scatter plot of calibrated RG pairs

Summary

A radar rainfall analysis was performed in support of Espey Consultants, Inc. for a rainfall event occurring on March 19-20th, 2006 over Mountain Creek. The primary radar data relied on for this analysis is the National Weather Service NEXRAD radar located near Ft. Worth, TX (KFWS). Radar rainfall combined with rain gauge data is used to enhance the accuracy of the rainfall product. During the analysis period, radar rainfall in 5-minute intervals was adjusted using ten NWS rain gauges. Storm total rainfall amounts for the 12 subbasins that comprise the Mountain Creek basin range from 5.5 – 8.2 inches with a mean of 7.1 inches. Based on comparison between radar and valid rain gauge accumulations, the resulting data accuracy is ±1.5% on average over the entire analysis period.

Statistical control of the data results in more accurate rainfall measurements. Comparison of gauge and radar accumulations is used to identify gauges that are performing inconsistently. Statistical comparison of gauge and radar rainfall amounts identifies statistical outliers that when removed improves the quality of the radar rainfall product. When used in combination, radar and gauge accumulations are more accurate than when either data source is used alone.

Metadata

Data accompanying this document provides a continuous rainfall record for the analysis period. Rainfall hyetographs for the Mountain Creek basin consisting of 12 subbasins are provided in shapefile format. The data file documentation follows:

Shapefile metadata:
State Plane 1983 North Central Texas (feet).
Time stamps in the dbf are in CST (mmddhhmm).
Data values represent 5-min accumulation (inches) at end of interval
The sum field represents rainfall in inches during the entire analysis period.

APPENDIX I
COST ESTIMATES

Alternative	Description	Estimated 100-yr WSE Reduction @ Jefferson St. (ft)	Estimated Cost ($)
1	Improvements to Central Channel	<0.5	$1,510,000
2	Improvements to West Channel including Excavation of Mobile Home Park	<0.5	$11,010,000
3*	Adds Demolition of Eastbound Jefferson Street Roadway at Secondary Channels	<0.5	$12,800,000
4A	Addition of Upstream Flood Storage - Mountain Creek Lake Operation	1.2	TBD
4B,C	Addition of Upstream Flood Storage - Regional Storm Water Detention	<1.0	$33,000,000 to $465,000,000
5	Combination of Alternatives 1, 2, 3, and 4A	1.7	$16,000,000 + ALT 4A
6	Enlargement of Jefferson & Main Street bridges and Main Stem Channel Improvements	2.5	$9,000,000 to $33,000,000

*Corollary Alternative 3: Benefit and Cost shown are for combination of Alternatives 1, 2, and 3.

		Earthen Channel			Concrete Pipe					
Alternative No.	Location of Improvement	Length (ft)	Bottom Width (ft)	Side Slopes (H:V)	Quantity	Length (ft)	Type	Easement Required (acres)	Total Probable Construction Cost ($)	Estimated Total Cost ($)
1	TBA	800	100	4	3	100	4 ft x 4 ft MBC	3.5	$ 650,000	
	IRA	700	130	4				3.2	$ 650,000	
	RT/GCA	500	60	4				1.4	$ 210,000	$ 1,510,000
2	TBA	750	60	4	3	100	4 ft x 4 ft MBC	1.9	$ 250,000	
	IRA	Buy-out & Excavation of 15-acre Mobile Home Park						15.0	$ 9,760,000	
	RT/GCA	1350	80	4				5.3	$ 1,000,000	$ 11,010,000
3	TBA	200	60/100	4				ROW	$ 300,000	$ 300,000
4	MCL	Modification of MCL Operations						0	TBD	TBD
	U/S MCL	Construction of 5,400-ac-ft Regional Storm Water Detention Facility						200	$ 33,600,000	$ 33,600,000
	UMCW	Construction of 400, 24-ac-ft Regional Storm Water Detention Facilities						20	$ 465,000,000	$ 465,000,000

Notes:

TBA - Thompson's Branch Area

IRA - Intermediate Roadway Area

RT/GCA - Race Track / Golf Course Area

UMCW - Upper Mountain Creek Watershed

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
Date 7-Mar-08

Title **Alternative 1: Thompson's Branch Area**

Item No.	Quantity	Unit	Item Description	Probable Construction Cost ESTIMATE Unit Price	Amount
1	22,000	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.	$ 12.00	$ 264,000.00
2	22,000	CY	**Compacted Fill and Channel Fill** complete including placing, compacting, and grading soil.	$ 2.00	$ 44,000.00
3	60	LF	**(3) 4'x 4' MBC Installation** including removal of existing culvert system	$ 480.00	$ 28,800.00
4	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 16,840.00
5	2,000	LF	**Silt Fence Erosion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and disposal.	$ 2.00	$ 4,000.00
6	1	LS	Nationwide 404 Permit		$ 40,000.00
7	3.5	Acre	Easement Required excluding the existing easement.	$ 21,000.00	$ 73,278.24
			Approximate time frame to obtain Nationwide Permit is 6 to 12 months.		
			Subtotal		**$ 470,918.24**
			Contingency **(15%)**		$ 70,637.74
			Subtotal		**$ 541,555.97**
8			Engineering and surveying **(20%)**		$ 108,311
			TOTAL ESTIMATED COST		**$ 650,000**

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
Date 7-Mar-08

Title **Alternative 1: Intermediate Roadway Area**

Item No.	Quantity	Unit	Item Description	Probable Construction Cost ESTIMATE Unit Price	Amount
1	24,000	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.	$ 12.00	$ 288,000.00
2	24,000	CY	**Compacted Fill and Channel Fill** complete including placing, compacting, and grading soil.	$ 2.00	$ 48,000.00
3	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 16,800.00
4	2,800	LF	**Silt Fence Erosion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and disposal.	$ 2.00	$ 5,600.00
5	1	LS	Nationwide 404 Permit		$ 40,000.00
6	3.2	Acre	Easement Required excluding the existing easement.	$ 21,000.00	$ 67,493.11
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		**$ 465,893.11**
			Contingency (15%)		$ 69,883.97
			Subtotal		**$ 535,777.08**
7			Engineering and surveying (20%)		$ 107,155
			TOTAL ESTIMATED COST		**$ 650,000**

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
Date 7-Mar-08

Title **Alternative 1: Race Track / Golf Course Area (Optional)**

				Probable Construction Cost ESTIMATE	
Item No.	**Quantity**	**Unit**	**Item Description**	**Unit Price**	**Amount**
1	5,000	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.	$ 12.00	$ 60,000.00
2	5,000	CY	**Compacted Fill and Channel Fill** complete including placing, compacting, and grading soil.	$ 2.00	$ 10,000.00
3	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 3,500.00
4	2,000	LF	**Silt Fence Erosion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and disposal.	$ 2.00	$ 4,000.00
5	1	LS	Nationwide 404 Permit		$ 40,000.00
6	1.4	Acre	Easement Required excluding the existing easement.	$ 21,000.00	$ 28,925.62
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		**$ 146,425.62**
			Contingency **(15%)**		$ 21,963.84
			Subtotal		**$ 168,389.46**
7			Engineering and surveying **(20%)**		$ 33,678
			TOTAL ESTIMATED COST		**$ 210,000**

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
Date 7-Mar-08

Title **Alternative 2: Thompson's Branch Area**

Item No.	Quantity	Unit	Item Description	Probable Construction Cost ESTIMATE Unit Price	Amount
1	5,000	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.	$ 12.00	$ 60,000.00
2	5,000	CY	**Compacted Fill and Channel Fill** complete including placing, compacting, and grading soil.	$ 2.00	$ 10,000.00
3	50	LF	**4'x 4' MBC Installation**	$ 480.00	$ 24,000.00
4	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 4,700.00
5	1,000	LF	**Silt Fence Erosion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and disposal.	$ 2.00	$ 2,000.00
6	1	LS	Nationwide 404 Permit		$ 40,000.00
7	1.9	Acre	Easement Required excluding the existing easement.	$ 21,000.00	$ 39,772.73
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		$ **180,472.73**
			Contingency **(15%)**		$ 27,070.91
			Subtotal		$ **207,543.64**
8			Engineering and surveying **(20%)**		$ 41,509
			TOTAL ESTIMATED COST		$ **250,000**

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
Date 7-Mar-08

Title **Alternative 2: Intermediate Roadway Area (no excavation of mobile home park)**

PRELIMINARY OPINION OF PROBABLE COSTS ESTIMATES
WILLOW BEND MOBILE HOMES
CITY OF GRAND PRAIRIE, TEXAS

ITEM	**Quantity**	**Units**	**Unit Price**		**Total Price**
APPRAISAL	1	EA	20000		$ 20,000
PROPERTY ACQUISITION	1	LS	877,640		$ 877,640
VALUE OF MOBILE HOMES	85	EA	17,500		$ 1,487,500
RELOCATION COST	85	EA	42,500		$ 3,612,500
HAZARDOUS MATERIAL CLEAN UP	85	EA	5,000		$ 425,000
CLEAN-UP AND DEMOLITION COST	85	EA	2,000		$ 170,000
PROJECT MANAGEMENT			10%		65926.4
ESTIMATE, DESIGN HAS NOT BEEN COMPLETED					$6,658,566
This total does not reflect engineering or technical services			Contingency @ 25%		$1,664,642
Project Contingency cost include litigation and public outreach.			**Total Estimate**		**$8,330,000**

Property Acquisition Cost base on unweighted DCAD apprised value.

Project Contingency cost include litigation and public outreach.

The Engineering has no control over the cost of labor, materials, equipment or over the Contractors methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at the time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
Date 7-Mar-08

Title **Alternative 2: Intermediate Roadway Area (with excavation of mobile home park)**

Item No.	Quantity	Unit	Item Description	Probable Construction Cost ESTIMATE Unit Price	Amount
1	15	Acre	Buy-out of Mobile Home Park and Easement (See 'Alternative 2: Intermediate Roadway Area (no excavation of mobile home park)')	$ -	$ 8,330,000.00
2	67,000	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.	$ 12.00	$ 804,000.00
3	67,000	CY	**Compacted Fill and Channel Fill** complete including placing, compacting, and grading soil.	$ 2.00	$ 134,000.00
4	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 46,900.00
5	5,000	LF	**Silt Fence Erosion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and disposal.	$ 2.00	$ 10,000.00
6	1	LS	Nationwide 404 Permit		$ 40,000.00
			Approximate time frame to obtain Nationwide Permit is 6 to 12 months.		
			Subtotal		**$ 9,364,900.00**
			Contingency **(15%)***		$ 155,235.00
			Subtotal		**$ 9,520,135.00**
7			Engineering and surveying **(20%)***		$ 238,027
			TOTAL ESTIMATED COST		**$ 9,760,000**

* Willow Bend Mobile Home Park buy-out cost already includes contingency. No additional contingency or Engineering and surveying costs were added for this task.

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
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Title **Alternative 2: Race Track / Golf Course Area**

				Probable Construction Cost ESTIMATE	
Item No.	**Quantity**	**Unit**	**Item Description**	**Unit Price**	**Amount**
1	38,000	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.	$ 12.00	$ 456,000.00
2	38,000	CY	**Compacted Fill and Channel Fill** complete including placing, compacting, and grading soil.	$ 2.00	$ 76,000.00
3	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 26,600.00
4	6,000	LF	**Silt Fence Erosion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and disposal.	$ 2.00	$ 12,000.00
5	1	LS	Nationwide 404 Permit		$ 40,000.00
6	5.3	Acre	Easement Required excluding the existing easement.	$ 21,000.00	$ 110,640.50
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		**$ 721,240.50**
			Contingency **(15%)**		$ 108,186.07
			Subtotal		**$ 829,426.57**
7			Engineering and surveying **(20%)**		$ 165,885
			TOTAL ESTIMATED COST		**$ 1,000,000**

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
Date 7-Mar-08

Title **Alternative 3: Eastbound Jefferson Road Partial Demolition / Channel Extensions**

Item No.	Quantity	Unit	Item Description	Unit Price	Amount
				Probable Construction Cost ESTIMATE	
1	5,000	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.	$ 12.00	$ 60,000.00
2	5,000	CY	**Disposal of Excavated Roadway,** including hauling of concrete, asphalt, and soil to nearest disposal facility	$ 25.00	$ 125,000.00
3	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 9,250.00
4	10,000	LF	**Silt Fence Erosion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and disposal.	$ 2.00	$ 20,000.00
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		**$ 214,250.00**
			Contingency (15%)		$ 32,137.50
			Subtotal		**$ 246,387.50**
5			Engineering and surveying (20%)		$ 49,278
			TOTAL ESTIMATED COST		**$ 300,000**

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
Date 7-Mar-08

Title **Alternative 4A: Modification of Mountain Creek Lake Operations**

				Probable Construction Cost ESTIMATE	
Item No.	**Quantity**	**Unit**	**Item Description**	**Unit Price**	**Amount**
			Subtotal		$ -
			Contingency (15%)		$ -
			Subtotal		$ -
			Engineering and surveying (20%)		$ -
			TOTAL ESTIMATED COST		**TBD**

NOTE: Alternative 4A requires no construction cost but easement cost and extent of associated impacts to dam safety and power plant operations have not been determined. Further investigation is required.

Project: Mountain Creek Flood Mitigation Alternatives
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By Espey Consultants
Date 7-Mar-08

Title **Alternative 4B: Mountain Creek Regional Storm Water Detention Facility**

				Probable Construction Cost ESTIMATE	
Item No.	**Quantity**	**Unit**	**Item Description**	**Unit Price**	**Amount**
1	1,350	Acre	Buy-out of Land Upstream of MCL, including Grand Prairie Country Club Golf Course	$ 21,000.00	$ 28,350,000.00
2	40,000	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.	$ 12.00	$ 480,000.00
3	40,000	CY	**Compacted Fill - Dam** complete including placing, compacting, and grading soil.	$ 2.00	$ 80,000.00
4	1	LF	**Dam Outlet Works**		$ 30,000.00
5	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 29,500.00
6	20,000	LF	**Silt Fence Erosion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and disposal.	$ 2.00	$ 40,000.00
7	1	LS	Nationwide 404 Permit		$ 40,000.00
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		**$ 29,049,500.00**
			Contingency **(15%)**		$ 4,357,425.00
			Subtotal		**$ 33,406,925.00**
8			Engineering and surveying **(20%)***		$ 160,885
			TOTAL ESTIMATED COST		**$ 33,600,000**

* Engineering and Surveying not included for buy-out.

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
Date 7-Mar-08

Title **Alternative 4C: Regional Storm Water Detention Facilities**

Item No.	Quantity	Unit	Item Description	Unit Price	Amount
				Probable Construction Cost ESTIMATE	
1	1,600	Acre	Buy-out of Upper Watershed Properties	$ 80,000.00	$ 128,000,000.00
2	15,500,000	CY	**Pond Excavation,** work fully performed as per details and specifications.	$ 12.00	$ 186,000,000.00
3	15,500,000	CY	**Compacted Fill** complete including placing, compacting, and grading soil.	$ 2.00	$ 31,000,000.00
4	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 10,850,000.00
5	1,000,000	LF	**Silt Fence Erosion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and disposal.	$ 2.00	$ 2,000,000.00
			Subtotal		**$ 357,850,000.00**
			Contingency **(15%)**		$ 53,677,500.00
			Subtotal		**$ 411,527,500.00**
6			Engineering and surveying **(20%)***		$ 52,865,500
			TOTAL ESTIMATED COST		**$ 465,000,000**

* Engineering and Surveying not included for buy-out.

Project: Mountain Creek Flood Mitigation Alternatives
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By Espey Consultants
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Title **Alternative 5: Combination of Alternatives 1, 2, 3, and 4A**

				Probable Construction Cost ESTIMATE	
Item No.	**Quantity**	**Unit**	**Item Description**	**Unit Price**	**Amount**
1	-	-	**Alternative 1,** including central channel improvements at Golf Course, excluding eastbound Jefferson Street culvert installation	-	$ 1,481,200.00
2	-	-	**Alternative 2,** including buy-out and excavation of Mobile Home Park, excluding eastbound Jefferson Street culvert improvements	-	$ 10,986,000.00
3	-	-	**Alternative 3**	-	$ 300,000.00
4	-	-	**Alternative 4A**	-	TBD*
			TOTAL ESTIMATED COST		**TBD**

* Alternative 4A cost to be determined.

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
Date 7-Mar-08

Title **Alternative 6: Main Stem Improvements - BRIDGE EXTENSION**

Item No.	Quantity	Unit	Item Description	Unit Price (Probable Construction Cost ESTIMATE)	Amount (Probable Construction Cost ESTIMATE)
1	4,800	SF	**Bridge Extension - EB Jefferson St,** cost include structure, mobilization, remove and approach for **Concrete Girder Pan Bridge**.	$ 121.00	$ 580,800.00
2	6,000	SF	**Bridge Extension - WB Jefferson St,** cost include structure, mobilization, remove and approach for **Concrete Slab Bridge.**	$ 193.00	$ 1,158,000.00
3	17,200	SF	**Bridge Extension - Main St,** cost include structure, mobilization, remove and approach for **Concrete Slab Bridge.**	$ 193.00	$ 3,319,600.00
5	400,000	CY	**Compacted Fill and Channel Fill** complete including placing, coompacting, and grading soil.	$ 2.00	$ 800,000.00
6	6,000	LF	**Silt Fence Erosoion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and disposal.	$ 2.00	$ 12,000.00
7	1	LS	Nationwide 404 Permit		$ 40,000.00
8	15	Acre	Easement Required excluding the existing easement.	$ 21,000.00	$ 315,000.00
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		**$ 6,225,400.00**
			Contingency **(15%)**		$ 933,810.00
			Subtotal		**$ 7,159,210.00**
7			Engineering and surveying **(20%)**		$ 1,431,842
			TOTAL ESTIMATED COST		**$ 8,600,000**

Note: Unit price for structures and percentage cost for other items are obtained from TXDOT website from the following link
http://www.dot.state.tx.us/publications/bridge/unit_costs.pdf

Project: Mountain Creek Flood Mitigation Alternatives
EC Job 6028
By Espey Consultants
Date 7-Mar-08

Title **Alternative 6: Main Stem Improvements - BRIDGE REPLACEMENT**

				Probable Construction Cost ESTIMATE	
Item No.	**Quantity**	**Unit**	**Item Description**	**Unit Price**	**Amount**
1	24,000	SF	**Bridge Extension - EB Jefferson St,** cost include structure, mobilization, remove and approach for **Concrete Girder Pan Bridge.**	$ 121.00	$ 2,904,000.00
2	30,250	SF	**Bridge Extension - WB Jefferson St,** cost include structure, mobilization, remove and approach for **Concrete Slab Bridge.**	$ 193.00	$ 5,838,250.00
3	71,000	SF	**Bridge Extension - Main St,** cost include structure, mobilization, remove and approach for **Concrete Slab Bridge.**	$ 193.00	$ 13,703,000.00
5	400,000	CY	**Compacted Fill and Channel Fill** complete including placing, coompacting, and grading soil.	$ 2.00	$ 800,000.00
6	6,000	LF	**Silt Fence Erosoion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and disposal.	$ 2.00	$ 12,000.00
7	1	LS	Nationwide 404 Permit		$ 40,000.00
8	15	Acre	Easement Required excluding the existing easement.	$ 21,000.00	$ 315,000.00
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		**$ 23,612,250.00**
			Contingency (15%)		$ 3,541,837.50
			Subtotal		**$ 27,154,087.50**
7			Engineering and surveying (20%)		$ 5,430,818
			TOTAL ESTIMATED COST		**$ 32,590,000**

Note: Unit price for structures and percentage cost for other items are obtained from TXDOT website from the following link
http://www.dot.state.tx.us/publications/bridge/unit_costs.pdf

APPENDIX J
ADVISORY AND PUBLIC MEETING NOTES

CERTIFICATE OF CITY SECRETARY

THE STATE OF TEXAS §

COUNTIES OF DALLAS, §
TARRANT AND ELLIS §

CITY OF GRAND PRAIRIE §

I, Catherine DiMaggio, City Secretary of the City of Grand Prairie, Texas, DO HEREBY CERTIFY as follows:

That the attached is a true and accurate copy of City of Grand Prairie Public Hearing Notice for the Mountain Creek Lake Flood Protection Study which was prepared and posted July 25, 2006.

IN WITNESS WHEREOF, I have hereunto signed my name officially and affixed the seal of the City, this the 25th day of July, 2006.

Catherine E. DiMaggio

Catherine DiMaggio, City Secretary
City of Grand Prairie, Texas

(City Seal)

PUBLIC HEARING NOTICE
CITY OF GRAND PRAIRIE
MOUNTAIN CREEK LAKE FLOOD PROTECTION STUDY
GRAND PRAIRIE DEVELOPMENT CENTER
206 W. CHURCH STREET
THE GRAND CONFERENCE ROOM
MONDAY, JULY 31, 2006
10:00 A.M. TO NOON
AGENDA

The City of Grand Prairie is jointly participating with Texas Water Development Board for a Flood Protection Planning Study of the Mountain Creek watershed. The study location extends from Mountain Creek at the confluence with the Trinity River to the downstream face of Joe Pool Lake Dam.

The existing Mountain Creek Flood Protection Plan Study is inadequate. The area is currently prone to flooding. Once a study is completed, recommendations will be made to reduce the local flood hazards to our citizens.

I. INTRODUCTION
   a. Welcome of interested parties
   b. Introduction of project sponsors
   c. Introduction of stakeholders
   d. Introduction of other interested parties
   e. City of Grand Prairie Flood Protection Goals

II. CITY OF GRAND PRAIRIE FLOOD PROTECTION GOALS
   a. FEMA Flood Reduction Goals
   b. City of Grand Prairie Floodplain Management

III. SCOPE OF STUDY
   a. Overview of Study
   b. Schedule for Public Input

IV. CITIZEN COMMENTS

V. CONCLUSION/ ADJOURNMENT

The Development Center is wheelchair accessible. If you plan to attend this public meeting and you have a disability that requires special arrangements, please call 972-237-8035 at least 24 hours in advance. Reasonable accommodations will be made to assist your needs. "In accordance with Chapter 551, Subchapter 6, of the Texas Government Code, this meeting notice and agenda was prepared and posted on this the 25TH day of July, 2006.

POSTED BY: Catherine E. DiMaggio

Mountain Creek Flood Protection Planning Study

Sheet 1 of 2

Meeting Location: The Grand Conference Room – Development Center

DATE: July 31, 2006 / 10:00 PM

Attendees	Organization	Phone	E-mail
Wayne Hunter	Espey Consultants, Inc.	214 951-0807 214 679-2765 cell	whunter@espeyconsultants.com
Michael Danella	USACE	817-886-1690	michael.a.danella@swf02.usace.army.mil
JOHN HERNDON	TRA. CRWS	972-331-4321	herndonj@trinityra.org
BRIAN REIS	ESPEY CONSULTANTS, INC.	(512) 326-5659	breis@espeyconsultants.com
GENE RICE	USACE	817 886 1374	GENE.T.RICE@SWF02.USACE.ARMY.MIL
Chase Ezell	Exelon	9726698660	cezell@morrowpr.com
RANDY TIPTON	EXELON	214-623-1018	RANDY.TIPTON@EXELONCORP.COM
Glen Dixon	City of Grand Prairie	972-237-8157	gdixon@gptx.org

See Attached Minutes:
File:

THE CITY OF GRAND PRAIRIE • TEXAS

Mountain Creek Flood Protection Planning Study

Sheet _________ of ________

Meeting Location: The Grand Conference Room – Development Center

DATE: July 31, 2006 / 10:00 PM

Attendees	Organization	Phone	E-mail
Randy Byers	GP	972-237-7593	rbyers@gptx.org
Tom Cox	GP	9-2378016	tcox@gptx.org
Chris Agnew	C.O.G.P.	972-237-8137	cagnew@gptx.org
Gilbert Ward	TWDB	512-463-6418	gward@twdb.state.tx.us
Yogi Patel	COD	214-948-4228	yogesh.patel@dallascityhall.com

See Attached Minutes:
File:

Mountain Creek Technical Advisory Board Meeting (TWDB)

Sheet 1 of

Meeting Location: The Council Briefing Room

DATE: October 11, 2007 10:00 AM

Attendees	Organization	Phone	E-mail
Joe Sherwin	City of G.P.	972-237-8157	jsherwin@GPTX.org
T. Lynn Lovell	HALFF	817-847-1422	llovell@halff.com
Stephen Crawford	HALFF	817-847-1422	scrawford@halff.com
Gene Rice	U.S. Army Corps of Engineers	817-886-1374	Gene.J.Rice@swf02.usace.army.mil
Romin Khavari	City of Grand Prairie	972-237-8145	RKhavari@GPTX.org
Randy Tipton	Exelon	214-623-1018	Randy.Tipton@exeloncorp.c
Chris Agnew	C.O.G.P.	x8137	cagnew@gptx.org
Gilbert Ward	TWDB	512-463-6418	gward@twdb.state.tx.us

See Attached Minutes:
File:

Josh Crowley	Espey	512-326-5659	jcrowley@espeyconsultants.co
Tom Mountz	Espey	512-326-5659	tmountz@espeyconsultants.com
Jack Tidwell	NCTCOG	817/695-9220	jtidwell@nctcog.org

Espey Consultants, Inc.
Environmental & Engineering Services

MEMORANDUM......

DATE: October 22, 2007

TO: Romin Khavari, P.E., CFM
City Engineer, Grand Prairie, Texas

FROM: Thomas W. Mountz, P.E., CFM Thomas W. Mountz

RE: Mountain Creek Flood Protection Plan
Advisory Committee Meeting, October 11, 2007

See Attached Sign-In sheet for attendees.

The meeting was called to order by Romin Khavari with the City of Grand Prairie (COGP). Joe Sherwin (COGP) gave a brief overview of the project, acknowledged TWDB funding, and introduced the Espey consultants (EC) staff making the presentation.

Tom Mountz (EC) opened the presentation with an overview of the Flood Protection Plan study and the purpose of the meeting. The purpose was to present the technical inputs and findings followed by the proposed alternatives for flood reduction. Comments from this meeting will be incorporated into the study findings prior to completion of the study report and a public presentation scheduled for next month. Mr. Mountz gave an overview of the study area and identified flood problem areas.

Josh Crowley (EC) next provided details of the hydrologic and hydraulic modeling performed for the study. The hydrologic model was prepared using the latest information available. Existing land use was developed using GIS spectral analysis of aerial photography while ultimate development impervious cover was based on the future land use map of COGP. Calibration analysis revealed that some limited storage occurs in Mountain Creek Lake due to dam outlet operating procedures. Therefore the study included minimal lake storage in the models. This achieved close approximation of observed operating flow calculations. The hydrologic analysis showed very little sensitivity to increases in impervious cover in the watershed. This verified that it was reasonable that the existing 100-year flow values could be very similar to the effective FEMA flow values calculated in the mid-1980's.

Hydraulic models were prepared using HEC-RAS steady state modeling. Digital LIDAR topography was enhanced by field survey of all bridges with in the study corridor. The study found that bridges on Jefferson and Main Streets in the west overbank were significantly less effective for flow conveyance than the FEMA model suggested. This ineffective flow change along with the small increase in flow resulted in raised water surface elevations (WSE) when compared to the effective FEMA results upstream of Main and Jefferson; as much as 2 feet in the 100-year design condition.

Mr. Crowley next discussed the additional hydrologic/hydraulic study performed at the request of COGP using HEC-RAS Unsteady flow modeling. He explained how the model applies the lateral inflow hydrographs and adjusts flow rate and elevation with time. This analysis reduces the peak design storm flow rates and lowers WSE values although there is still a "bump up" in the profile for the Main & Jefferson bridges. The unsteady model does not use a tailwater condition on the West Fork of the Trinity River as a boundray condition, instead it uses a normal depth assumption. Some discussion followed between COGP, Halff Associates, USACE, and EC on boundary conditions relative to the West Fork. Halff suggested starting from the backwater in the West Fork CDC model by the Corps that is available. EC looked at the potential impacts for coincident peaks and found that the Trinity WSE could impact WSEs in Mountain Creek (MC) all the way back to the dam. However, this was not used in the final model because the significant differences in watershed size and timing of peak flows means it is unlikely that there would be coincident peaks on both waterways. It was determined that an accurate floodplain would consist of the Mountain Creek floodplain (with a normal depth boundary condition) and the 100-year West Fork WSE at the confluence overlaid in all areas that it is higher. The floodplains presented in this study are those of Mountain Creek alone.

During discussion of calibration of the HEC-HMS and HEC-RAS models, several items were discussed. Mr. Crowley noted that USGS had told EC that the gage at Jefferson flow-rate reporting was suspect but that the elevation data was accurate. USGS had also indicated a desire to abandon the gage. Joe Sherwin with COGP noted that the NWS also used the gage for flood forecasting so there were no immediate plans for abandonment. He also indicated that the recently completed Early Warning study included recommendations for using the gage data. Randy Tipton with Exelon expressed surprise at the USGS statements, as he was in the process of funding and implementing an upgrade of that gage. EC also discussed the Exelon provided flow tables for the Mountain Creek Lake Dam gates. EC found that the tables were developed based on the assumption that there was no tailwater during flow releases above the bottom-of-gate elevation of 431.0 feet. The EC models show that downstream WSEs exceed 431.0 ft for all events studied, including the 2-year event. EC suggested that the flow discharge may be slightly lower than Exelon reports because of this inconsistency.

EC presented maps showing the extent of inundation in the study area resulting from the Existing and Ultimate Conditions Steady-State HEC-RAS models and the Existing Conditions Unsteady HEC-RAS model. The maps showed the floodplain extents for the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year design storm events. There was discussion about the floodplains shown in the area between the railroad and IH-30. EC had removed some low lying lakes that showed in the 5-year storm because there is a low levee (railroad spur) through the region running north to south. The map showed all area outside of the newly filled industrial site to be covered by the 10-year event. COGP requested that the 5-year information be restored, even though no development will be allowed there, because there are several pipes allowing flow through the levee/spur.

Prior to studying alternatives for various flooding issues on Mountain Creek, COGP requested a separate study on Thompson's Branch. Thompson's Branch (TB) is the only major tributary to Mountain Creek in the study area. It is a small man-made un-maintained channel surrounded by salvage car lots. EC discussed the current channel capacity and several different alternatives to handle and control local flooding issues. The least expensive option, clearing and maintaining the existing channel, was discussed as the preferred alternative. This is because the entire TB study area is within, and flood elevations are dominated by, the 5 to 10-year floodplain of Mountain Creek. COGP requested that this added study report not be included in the upcoming Mountain Creek public meeting presentation because all proposed alternatives impact local flows only and that might be confusing to the public.

Mr. Mountz next discussed the existing problem areas within the Mountain Creek Study and alternatives evaluated to deal with the problems. The problem areas were divided into three zones; the Thompson's Branch zone south of Jefferson, the Intermediate Roadway zone between Jefferson and Main Streets, and the Raceway/Golf Course zone between Main Street and the railroad tracks. In all three zones there are localized flooding issues and backwater/ineffective flow issues from Mountain Creek flood flows. The majority of the flood problem areas have elevations below the 5-year and/or 10-year floodplains. They also have little or no "positive" outflow connections to Mountain Creek due to previous construction activities.

Several alternatives were studied that require improvements in each of the three zones to improve conveyance of local flows and MC overflows. Alternative #1 is to re-establish a previously existing side flow channel in the effective floodway. Alternative #2 re-connects the channel flowing by the existing mobile home park in the Intermediate Roadway zone to MC. It was noted that no viable solution, other than a previously proposed buyout, was found to significantly impact the mobile home park flooding situation. Alternative #3 combined #1 and #2 with taking through traffic off of eastbound Jefferson Street and removing the undersized culverts found there. It was found that even though local drainage and the time delay in draining MC overflows were improved the actual reduction in 100-year WSEs was, in all cases, less than 0.5 feet.

COGP suggested adding another alternative. They asked what size of bridge improvement on the main channel of MC would be necessary to provide conveyance through Jefferson and Main Street bridges to remove the existing 2 foot "bump" in the WSE profile. This will be examined independent of the roadway modifications considered in Alternatives #1 through #3.

Alternative #4 was also presented. This alternative would involve providing additional storage volume for storm flows upstream of Mountain Creek Lake Dam. EC presented three methods by which this might be achieved. First (Option A) was additional storage in the lake itself through modification of operating procedures by Exelon during flood events. Rough calculations by EC showed that storage equivalent to a four foot rise in the lake water surface would result in approximately 9600 acre-feet of volume and would lower the flow and WSE of the 100-year to roughly that of the existing 25-year storm. Randy Tipton of Exelon objected to this methodology. He cited several problems. He indicated that the operating range of the lake was only between 456 and 457.5 ft. He said the maximum elevation allowed is 458 ft as this would overtop the existing Tainter gates. There was also doubt expressed by several parties about the structural integrity of the dam with higher storage elevations. Mr. Mountz stated that the projected rise was done hypothetically and that much more detailed analysis would be required prior to actually implementing such an operational change. However, the proposed storage volume was assumed to show the range of effort necessary to significantly impact the study area floodplains.

Subsequent to the Advisory Committee meeting, EC reviewed the plans previously received from Exelon for the Mountain Creek Lake Dam and gates. According to the record drawings the bottom of the spillway is at elevation 413.0. The top of dam is shown at elevation 467.0 and the top of the gates and gate supports are at elevation 469 and 472.5 respectively. The plans show the normal pool elevation at either 457.0 or 457.5. Based on this information on the dam only, it appears feasible to allow up to 4 feet of flood pool in the lake.

Option B for upstream storage would involve placing a low rise flood control structure across the existing floodplain of Mountain Creek, Fish Creek, and Artesian Creek at the upstream end of the lake. Without excavation approximately 5000 acre-feet of dry detention storage could be gained. This also would require additional study and coordination with jurisdictions other than COGP to ensure no adverse impacts would result to the properties along the existing waterway. One advantage to this option would be the possibility of including sedimentation traps within the facility to catch sediment before it can enter MCL.

Option C was presented but not considered viable by EC. It would require a significant number of large detention basins throughout the tributary reaches in the city to provide equivalent storage capacity provided in Options A and B.

Discussion followed about how much actual benefit there would be to Alternative #4. Even though the storage volume assumed in the study would reduce the peak flow and thus the peak WSE by one to two feet, what did that really mean? Reviewing the inundation maps revealed that most of the flooded properties downstream of the lake would remain flooded at the 25-year level. It was suggested that EC prepare a map and discuss the maximum reduction resulting from a combination of Alternatives 1 through 4. EC will prepare this combined alternative and show the results in the 100-year event and the 10-year event. The 10-year event was suggested because there could be significant reductions in lesser event flooding that are not reflected in the major flooding events. Maps of the combined improvements will be presented at the public meeting.

EC raised one final issue before adjournment. The issue is beyond the scope of this study but one that could potentially bring substantial additional benefits from changing the operation of MCL to include flood storage. The additional storage could be used to offset CDC valley storage requirements in the CDC area extending to the MCL dam. Instead of reducing the WSE the additional storage could offset site fill to raise some properties out of the 100-year floodplain. This offsetting compensation is not currently allowed under CDC agreements and discussions with NCTCOG and other participating cities including the City of Dallas would be necessary to determine if such compensation would be valid.

In summary, the following are the items EC was charged to investigate and add to the study reporting prior to the public meeting scheduled in November:

1. COGP requested that the 5-year flood inundation information be restored to the map behind the levee/railroad spur located between the railroad tracks and IH-30.

2. Determine what size of bridge improvement would be necessary to provide conveyance through Jefferson and Main Street bridges on the main channel of Mountain Creek to remove the existing 2 foot "bump" in the 100-year WSE profile.

3. Prepare a map and discuss the maximum flow and WSE reduction resulting from a combination of Alternatives 1 through 4. EC will prepare this combined alternative and show the results by mapping the 100-year event and the 10-year event floodplains.

Mountain Creek Lake Flood
Protection Study Public Meeting
City of Grand Prairie Development Center
Grand Conference Room
November 9, 2007
10:00 a.m. to 12:00 Noon

The City of Grand Prairie is jointly participating with Texas Water Development Board for a Flood Protection Planning Study of the Mountain Creek watershed. The study location extends from Mountain Creek at the confluence with the Trinity River to the downstream face of Joe Pool Lake Dam.

The existing Mountain Creek study is inadequate, and the area is subject to flooding. Once a study is completed, recommendations shall be made to reduce the local flood hazards to our citizens. The City of Grand Prairie in participation with the Texas Water Development Board is conducting this public meeting. All interested parties are invited.

Agenda

I. Introduction
   a. Introduction of project sponsors
   b. Introduction of stakeholders
   c. Introduction of other interested parties
   d. City of Grand Prairie Flood Protection Goals

II. City of Grand Prairie Flood Protection Goals
   a. City of Grand Prairie Floodplain Management

III. Scope of Study
   a. Overview of Study
   b. Technical Update
   c. Alternatives

IV. Public Discussion
   a. Public comments

V. Conclusion/Adjournment

In accordance with Chapter 551, Subchapter C of the Government Code, V.T.C.A., this agenda was prepared and posted this the 26th day of October, 2007.

Catherine E. DiMaggio, City Secretary

The Development Center is wheelchair accessible. If you plan to attend this public meeting and you have a disability that requires special arrangements, please call 972-237-8138 at least 24 hours in advance. Reasonable accommodations will be made to assist your needs.

Mountain Creek Public Meeting

Sheet 1 of 3

Meeting Location: The Development Center – The Grand Conference Room

DATE: November 9, 2007 10:00 AM

Attendees	Organization	Phone	E-mail
Gilbert Ward	Texas Water Development Bd	512-463-6418	gward@twdb.state.tx.us
Michael Parent	Insurance Auto Auctions	(214) 886-5307	mparent@iaai.com
Norman Miner	4226 E Main MJB Properties	(817)9190313	NMiner50@SBCGlobal.net
Chris Agnew	C.O.GP	972-237-8137	cagnew@gptx.org
Ron McCuller	"	972-237-8066	rmcculle@gptx.org
Doug Sweeney	Our Prairie	469-212-0634	dsweeney@ourprairielp.com
Hal T Thorne	Atty. Our Prairie	469-212-0636	hthorne@ourprairielp.com
Jim Baker	Copart	817-913-7619	jim.baker@copart.com

See Attached Minutes:
File:

Mountain Creek Public Meeting

Meeting Location: The Development Center – The Grand Conference Room

DATE: November 9, 2007 10:00 AM

Attendees	Organization	Phone	E-mail
Joe Sherwin	City of Grand Prairie	972-237-8157	jsherwin@gptx.org
Romin Khavari	" " "	" " 8145	rkhavari@gptx.org
MIKE HOLT	HSG	972-660-7263	HOLTSAND@SBCGLOBAL.NET
RANDY TIPTON	EXELON	214 623 1018	RANDY.TIPTON@EXELONCORP.COM
Michelle Marriott	Baker Botts	214-953-6500	michelle.marriott@bakerbotts.com
Valencia McClure	Exelon	817-446-2812	valencia.mcclure@exeloncorp.com
JACK TIDWELL	NCTCOG	817 695-9220	jtidwell@nctcog.org
Randy J. Byers	City of Grand Prairie	972-237-7593	rbyers@gptx.org
T. Lynn LOVELL	HALFF ASSOCIATES, INC	817-847-1422	llovell@halff.com

See Attached Minutes:
File:

Mountain Creek Public Meeting

Meeting Location: The Development Center – The Grand Conference Room

DATE: November 9, 2007 10:00 AM

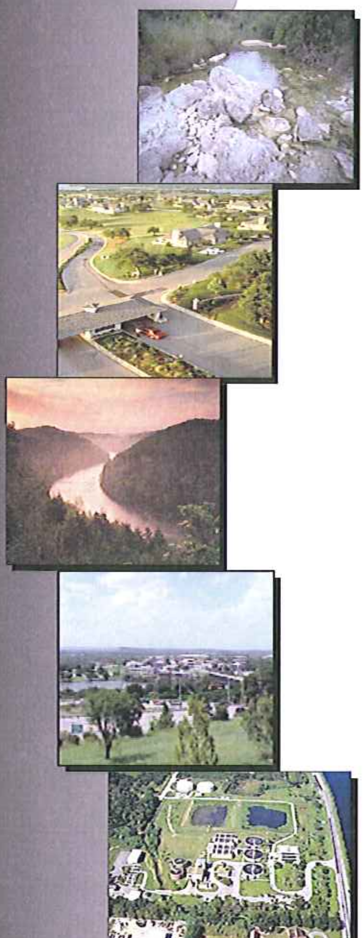
Attendees	Organization	Phone	E-mail
Joe Kiesel Cliff Moody	Awesome Auto ABC Truck & Auto	972 263-1991 972-263-1014	JKiesel@[illegible] DRF58 at AOL.c[illegible]
Tom Mountz	Espey Consultants	(512) 326-5659	tmountz@espeyconsultants.com

See Attached Minutes:
File:

APPENDIX K
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS REPORT

Espey Consultants, Inc.

THOMPSON'S BRANCH CONCEPTUAL ANALYSIS



DRAFT

City of Grand Prairie

August 1, 2007

Project No. 6028.101

THOMPSON'S BRANCH CONCEPTUAL ANALYSIS

Prepared for:

City of Grand Prairie
Public Works Engineering Department
206 W. Church Street
Grand Prairie, TX 75050

By:

Espey Consultants, Inc.
3809 South 2nd St., Suite B-300
Austin, Texas 78704

EC Project No. 6028.101

August 1, 2007

T (512) 326-5659
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EXECUTIVE SUMMARY

Thompson's Branch is a channelized waterway, tributary to Mountain Creek, located in Grand Prairie, Texas. The majority of the channel and adjacent properties lie within the 100-year floodplain of Mountain Creek. However, localized flooding issues have prompted the City of Grand Prairie to commission this study to investigate alternatives that would minimize the local flooding potential.

This study provides hydrologic and hydraulic models of existing and proposed conditions for the channel. The existing channel contains significant vegetation and the City does not have full drainage easement coverage. The 1997 design plans show the design flow capacity as the 5-year flood event. This study shows that the existing channel cross-section and profile is approximately the same as the original design but has an approximate flow capacity equivalent to the 2-year flood event.

The study examines five (5) alternative channel improvement measures to provide better flow conveyance with varying levels of localized flood protection. All alternatives will require the acquisition of additional drainage easements and may require a Section 404 Permit from the U.S. Army Corps of Engineers for impacts to Waters of the U.S. Alternative 1 involves only the cleaning, mowing and grubbing, of vegetation in the channel without any physical changes to the cross-section or flowline. Alternatives 2 and 3 require the expansion of the channel cross-section to a 50-foot bottom width. The difference between the two options is the placement of excavated materials on low-lying areas adjacent to the channel in Alternative 3, rather than hauling the material offsite. Alternative 4 expands the channel to a 90-foot bottom width to fully contain the Thompson's Branch 100-year flood flows within the channel, also with limited adjacent fill. Alternative 5, the most expensive and permit intensive option, also contains the 100-year flood flows using a 50-foot bottom width in a proposed concrete-lined channel. Table 7 from the report summarizes the alternative designs.

Table 7. Alternatives Comparison Table

Alternative No	Channel Type	Bottom Width (ft)	Side Slopes (H:V)	Easement Required (Acres)	Design Event	404 Permit Requirement	Approx Time for Permit Procurement	Total Probable Construction Cost ($)
1 *	Earthen	20 to 30	3:1	NA	5 Yr	Nationwide Permit	6 to 12 months	**$233,000**
2	Earthen	50	3:1	11.31	10 Yr	Nationwide Permit	6 to 12 months	**$1,030,000**
3	Earthen	50	3:1	11.31	25 Yr	Nationwide Permit	6 to 12 months	**$960,000**
4	Earthen	90	3:1	14.70	100 Yr	Nationwide Permit	6 to 12 months	**$1,950,000**
5	Concrete	50	3:1	10.16	100 Yr	Individual permit	24 months	**$5,470,000**

* Alternative 1 is cleaning and periodic maintenance of existing channel.

The report recommends Alternative 3 as the most cost-effective and beneficial option for the level of protection provided. However, it again notes that the improved channel and adjacent properties will still remain within the Mountain Creek floodplain regardless of the alternative selected.

1.0 INTRODUCTION

Thompson's Branch is located in Grand Prairie, Texas, and is a tributary of Mountain Creek which is currently being studied as part of the Mountain Creek Flood Protection Plan. The reach of Thompson's Brach included in this scope extends east from Idlewild Road downstream to its confluence with Mountain Creek for an approximate distance of 5000 feet. To the North of the stream there are salvage car lots and to the South includes salvage car lots and undeveloped land. Primarily car lots to the North of the channel drain to the storm drains along Jefferson Street and to the channels flowing to North of Jefferson Street. Areas to the south of the channel primarily drain into the channel. A mix of urbanized and undeveloped areas of approximately 570 acres drains into Thompson's Brach from the West and Northwest of Idlewild Road. The total area draining into Thompson's Branch is approximately 900 acres. The floodplain associated with Thompson's Branch is an area that has experienced extensive flooding to adjacent properties. The existing earthen channel is characterized by a roughly defined 10 foot bottom width channel with heavy growth along its length and banks. The side slopes are generally 3:1 (horizontal to vertical).

Preliminary studies have shown that Mountain Creek 100-year floodplain inundates the entire Thompson's Branch channel area included in this study. Preliminary studies on Mountain Creek have also shown that the majority of the property adjoining the channel remains inundated one to two feet, on average, by the Mountain Creek 5-year (20% annual chance) design storm, with water surface elevations approximately 4.5 feet lower than the 100-year event However, the area has also experienced flooding from local flows. Therefore this study has been requested by the City of Grand Prairie to determine the extent of this localized flooding potential and to investigate alternatives to minimize that flooding.

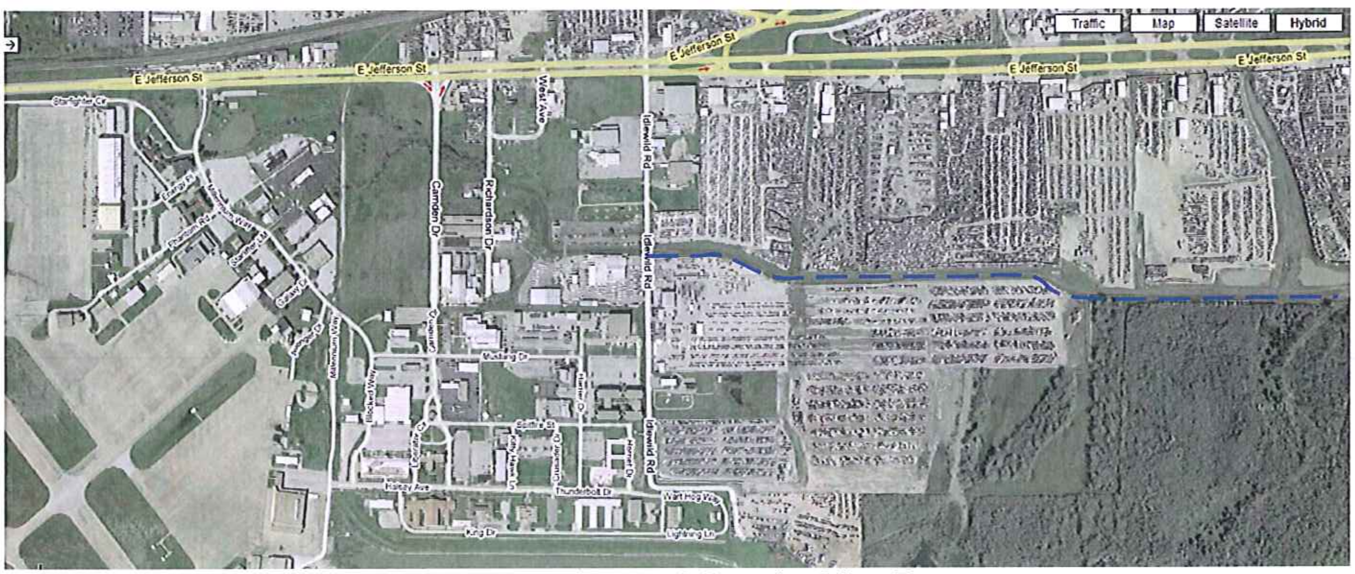


Figure 1. Thompson's Branch Location Map, Texas

1.1 SCOPE OF SERVICES

The purpose of this project is to develop the preliminary design of channel improvements and identify additional requirements necessary to proceed with the development of construction plans and publicly bid the project for construction. Construction plans, bid phase services and construction phase services are not included in this scope of services. The scope includes the following:

- to provide channel analysis and evaluation of various flood mitigation alternatives;
- to identify easement requirements of properties adjacent to the channel;

- to determine any Section 404 permitting requirements;
- to provide a cost evaluation of the various channel design options; and
- to provide a summary letter report of the findings.

2.0 HYDROLOGIC ANALYSIS

As part of the Mountain Creek Floodplain Study, hydrologic analysis was performed for Thompson's Branch for existing conditions 50%, 20%, 10%, 4%, 2% and 1% (2-, 5-, 10-, 25-, 50- and 100-year) annual chance storms. This analysis was performed dividing the 900 acre drainage areas into two drainage basins of 329 acres and 570 acres for the purpose of analysis.

Version 3.1.0 of the HEC-HMS computer program developed by the Hydrologic Engineering Center of the U. S. Army Corps of Engineers (USACE) was used in this analysis to estimate peak flow rates along each reach. Peak flow rates were computed along the watercourses for the 50%, 10%, 4%, 1%, and ultimate 1% annual chance storm events. This hydrology section describes the input parameters used in this analysis.

2.1.1 DRAINAGE AREA DELINEATION

The watersheds are delineated using United States Geological Survey (USGS) topographical survey data, City of Grand Prairie LIDAR data, City of Grand Prairie storm drain drawings and available site or highway record drawings. A drainage area map showing the watershed delineation and sub area nomenclature is included in Appendix A as Exhibit 1.

2.1.2 PRECIPITATION

The design storms used in this study were derived from a hypothetical 24-hour distribution. The distribution of Depth-Area-Duration (DAD) precipitation uses rainfall data from durations of 5 minutes to 24 hours. The statistical precipitation values were taken from the City of Grand Prairie Drainage Design Manual and are shown in Table 1.

Table 1. Depth – Duration Rainfall Data

TABLE 5.4C - Depth-Duration Data								
Return Period (years)	Point Rainfall Depths (inches)							
	5-min	15-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
1	0.39	0.76	1.49	1.81	1.99	2.41	2.80	3.21
2	0.49	1.04	1.85	2.22	2.45	2.91	3.45	3.95
5	0.57	1.22	2.45	3.00	3.30	3.90	4.70	5.40
10	0.63	1.36	2.86	3.55	3.85	4.65	5.50	6.40
25	0.73	1.56	3.35	4.15	4.55	5.45	6.50	7.50
50	0.80	1.71	3.82	4.65	5.15	6.20	7.35	8.52
100	0.87	1.87	4.25	5.20	5.70	6.92	8.40	9.55
500	1.00	2.20	5.40	6.60	7.40	8.80	10.50	12.00

2.1.3 INFILTRATION LOSSES

A spectral analysis was conducted for this watershed using 2004 color infrared aerial photographs. Spectral analysis is a type of remote sensing technology that searches aerial images for specific spectral signatures to identify impervious areas. This method was utilized to determine the extent of impervious areas for each sub-basin within the Mountain Creek watershed.

Land use data is provided by the City of Grand Prairie and National Agricultural Imagery Program (NAIP) from TNRIS website. The City's land use map is merged with the national land use map[1] from TNRIS to create a composite map in the areas of overlap, the National land use map controls. This data reflects land use for the year 2004 for the National map and reflects land use for the year 2000 for the City's map. During analysis it was noted that vacant areas in the City's data were built-up according to the National map. Impervious cover values are assigned to the various land use types. Land use types are based on nationally accepted land use and the City of Grand Prairie land use categories.

The hydrologic model utilizes weighted impervious cover values calculated for each watershed sub-area. All assumed impervious cover values are based on City of Grand Prairie criteria as well as previous watershed studies. A table describing weighted land use impervious cover values and corresponding curve numbers are shown in the table below.

Table 2. Hydrologic Parameters

Subbasin	Impervious Area (acres)	Drainage Area (acres)	Percentage IC	Curve Numbers
TB-01	200	329	61%	80
TB-02	371	570	65%	80

2.1.4 TIME OF CONCENTRATION

The methods prescribed in the NRCS' Technical Release 55 (TR-55) are used to determine the times of concentration for each flow segment in this analysis. Lag time calculated using the above method for Sub-basin TB-01 (downstream of Idlewild Rd) is **13 minutes** and for TB-02 sub-basin (upstream of Idlewild Rd) is **28 minutes** respectively.

2.1.5 STREAM FLOW ROUTING

The Muskingum-Cunge method of stream flow routing was used in this analysis to modify hydrographs to reflect the effects of translation and attenuation within a channel reach. The required input for this method includes: channel length, channel slope, Manning's roughness coefficients, and an estimate of the hydraulic grade line slope. A trapezoidal channel shape is used to represent a typical channel section through each stream routing reach. A composite roughness coefficient is estimated in each routing reach based on a channel roughness coefficient of 0.06 and an overbank roughness coefficient ranging from 0.06 to 0.1. In the hydrologic model for Mountain Creek Flood Plain Study, the Modified Puls stream routing method is used to be consistent with other drainage basins. However; the change in the estimated flows did not vary more than

[1] The national land use map dataset was obtained from the United States Environmental Protection Agency (EPA) and was projected by TNRIS to the Texas State Mapping System Lambert Projection.

10% (higher peak flows through Muskingum-Cunge method); therefore, for the purpose of this analysis, flows estimated using the Muskingum-Cunge method are used.

2.1.6 HYDROLOGIC ANALYSIS RESULTS

The following table provides a summary of hydraulic modeling results for Thompson's Branch based on our analysis.

Table 3. Hydrologic Analysis Results

	Flow (cfs)					
Subbasin	1% Storm (100 yr)	2% Storm (50 yr)	4% Storm (25 yr)	10% Storm (10 yr)	20% Storm (5 yr)	50% Storm (2 yr)
TB-02 (At Idlewild Rd)	2550	2280	2010	1690	1390	960
TB_A Junction (At the confluence with Mountain Creek)	3400	3010	2610	2140	1730	1120

3.0 HYDRAULIC ANALYSIS

The hydraulic analysis is conducted on Thompson's Branch reach as defined within the Mountain Creek Flood Protection Plan. The total length of the stream included in this study is approximately 5000 feet. This hydraulic analysis computes existing channel, water surface elevations for the 50%, 20%, 10%, 4%, 2%, and 1%, annual chance (2-, 5-, 10-, 25-, 50-, and100-year, respectively) storm events. Again, it is important to note that the analysis described herein is for the localized flow conditions from Thompson's Branch only because the 100-year floodplain of Mountain Creek inundates the study area to an even greater extent.

The USACE HEC-RAS software version 3.1.3 is used for the hydraulic analyses. All modeling is one dimensional and steady state. The sections that follow describe the development of the hydraulic models both in general terms and specifics that apply to the reach.

3.1.1 CROSS SECTIONS

Model cross sections are placed along the stream using the available contour data and previous survey cross section locations based on Keeton Surveying Company's survey data. In total, 10 cross sections were developed by field survey (Data was secured by Marshall Lancaster & Associates, Inc.) at the above determined locations. For areas on the over banks of the cross sections, Geo-RAS software was used to develop the cross sections from 2-foot contour interval LIDAR data provided by City of Grand Prairie.

3.1.2 PARAMETER ESTIMATION

The following tables show the *Manning's n* values for existing and proposed alternatives that will be discussed in greater detail in following sections of this report. It should be noted that the salvage car lots are modeled as blocked obstructions. Proposed *n* values in the models are based on the presumption of continued channel maintenance on, at least, an annual basis.

Table 4. *Manning's n* Table (Existing condition)

RS	LOB	Channel	ROB
4901	0.1	0.06	0.1
4602	0.1	0.06	0.1
4104	0.1	0.06	0.1
3597	0.1	0.06	0.1
3098	0.1	0.06	0.1
2597	0.1	0.06	0.1
2097	0.1	0.06	0.1
1600	0.1	0.06	0.1
1098	0.1	0.06	0.06
738	0.1	0.06	0.06

Table 5. *Manning's n* Table (Proposed 50-ft bottom width & 90-ft. bottom width grass-lined channels)

RS	LOB	Channel	ROB
4901	0.1	0.04	0.1
4602	0.1	0.04	0.1
4104	0.1	0.04	0.1
3597	0.1	0.04	0.1
3098	0.1	0.04	0.1
2597	0.1	0.04	0.1
2097	0.1	0.04	0.1
1600	0.1	0.04	0.1
1098	0.1	0.04	0.06
738	0.1	0.04	0.06

Table 6. *Manning's n* Table (Proposed 50-ft bottom width with concrete lining)

RS	LOB	Channel	ROB
4901	0.1	0.013	0.1
4602	0.1	0.013	0.1
4104	0.1	0.013	0.1
3597	0.1	0.013	0.1
3098	0.1	0.013	0.1
2597	0.1	0.013	0.1
2097	0.1	0.013	0.1
1600	0.1	0.013	0.1
1098	0.1	0.013	0.06
738	0.1	0.04	0.06

Note:
- RS is river station of the channel.
- LOB is left over bank of the channel.
- ROB is right over bank of the channel.

3.1.3 BOUNDARY CONDITIONS

For the Hydraulic analysis; normal depth condition is used as the starting water surface elevation and the estimated normal depth slope is 0.0025. Tail water condition from West Fork or Mountain Creek is not taken into consideration, because either condition would inundate Thompson's Branch drainage area.

3.1.4 HYDRAULIC ANALYSIS SUMMARY AND RESULTS

The comprehensive hydraulic analysis of Thompson's Branch includes LIDAR topographic data, field surveyed data and construction records data.

Cross sections used in this hydraulic analysis are geographically referenced (horizontally) to the North American Datum (NAD) of 1983 – State Plane, South Central Texas Zone, US feet. Water surface elevations for each cross section are mapped onto the City's 2003 LIDAR data, which is referenced (vertically) to the NAVD of 1988. The existing conditions and proposed conditions floodplain map for Thompson's Branch are included in this report as Exhibit 2 and Exhibit 3 of Appendix A.

HEC-RAS model results for existing conditions determined that, the 2-year flood stays predominantly within the existing channel. All other flood events (5-, 10-, 25-, 50- and 100-year) flood the areas North and South of the channel. See the flood plain map for 100-yr and 10-yr existing conditions in Exhibit 2 and Exhibit 3 of Appendix A. For the above analysis normal depth condition is used as the starting water surface elevation. Tail water conditions from West Fork or Mountain Creek nor inundation by Mountain Creek flows are not taken into consideration.

3.1.5 EXISTING CHANNEL COMPARED TO 1997 DESIGN CHANNEL

The existing channel was designed and built in 1997-98. A comparison of the existing channel cross-sections and profile was made to serve as a baseline for the alternatives analysis. The comparative investigation was completed to identify areas of siltation or scouring and to determine other geometry changes that may have resulted in a smaller or larger conveyance channel than the 1997 design. To accomplish the above task, Espey Consultants, Inc. developed HEC-RAS model using as-built drawings provided by Keeton Surveying Company. The As-built drawings were originally prepared by Morrison Hydrology/Engineering, Inc. The summary comparison of the existing channel model with the 1997 design channel model is:

- Majority of the cross sections are of roughly the same size or slightly larger than the as-built. No significant difference was noticed in the geometry of cross sections except at the farthest downstream station where the channel was widened with a subsequent project. Exhibits 7, 8, & 9 in Appendix A show the comparison of the cross sections.
- Silting was noticed along one stretch of approximately 400 ft in the upper reach of the channel. The remainder of the channel shows evidence of scouring to depths varying from 0.5 ft to 1.5 ft. Exhibit 6 in Appendix A shows the profile of the channels.
- Hydraulic analyses show that existing channel can predominantly contain only the 2-yr flood event within the channel while the 1997 channel was designed to convey the 5-yr flood event. The reduction in capacity of the existing channel can be attributed to excessive growth of vegetation in the channel and, in part, to the flatter slope of the scoured channel.
- If the existing channel vegetation is mowed and grubbed with similar maintenance performed on an annual basis, the analysis shows the channel can predominantly contain 5-yr flood event similar to the original 1997 design channel. This is discussed further in the following Alternatives Section of this report.

4.0 FLOOD MITIGATION ALTERNATIVES

This analysis considers five alternative solutions to mitigate local flooding events on Thompson's Branch and provide the city a tool to assess which alternative provides the greatest benefit in relationship to the cost. It should be noted that these proposed alternatives are intended to deal with nuisance flooding form localized rainfall events in the Thompson's Branch drainage basin only. The alternatives will **not** obviate flooding of adjacent properties by Mountain Creek. To assist the City in prioritizing which projects should be funded, the alternatives are assessed with a combination of cost of implementation and associated benefits. The five alternatives analyzed are described as follows:

- Alternative 1: Cleaning and regularly maintained existing channel.
- Alternative 2: 50 foot bottom width grass channel with 3:1 (horizontal: vertical) side slopes (10yr-design)
- Alternative 3: 50 foot bottom width grass channel with 3:1 (horizontal: vertical) side slopes (25-yr design)
- Alternative 4: 90 foot bottom width grass channel with 3:1 (horizontal: vertical) side slopes and limited over bank fill.
- Alternative 5: 50 foot bottom width concrete channel with 3:1 (horizontal: vertical) side slopes.

Each of these alternatives is discussed in the sections that follow. The cost benefit analysis is a preliminary estimate of construction costs based on recent bid tabulations provided by the City of Grand Prairie and cost estimation provided by local contractor. Each alternative will require a Section 404 permit from the U.S. Army Corps of Engineers although the level of permit needed varies somewhat. This will be discussed further in the summary section below. Alternative 5 is discussed below in detail, however the cost benefit analysis and 404 permit requirement shows that it is not a viable option.

4.1 REGULATORY COMPLIANCE

Prior to commencement of construction, it will be necessary to submit the project and appropriate permit applications to regulatory agencies. A detailed review and acquisition of the necessary permits for the construction of these project(s) exceeds the scope of this contract. However, the following brief discussion of Section 404 permits is included because the permitting issues significantly impact the construction options and costs for each alternative. This discussion is intended to be general in nature and does not comprehensively outline permit requirements and agency coordination.

Pursuant to Section 404 of the Clean Water Act and the Rules and Regulations promulgated there under by the United States Environmental Protection Agency (USEPA) and the United States Army Corps of Engineers (USACE), the filling or excavation of waters of the United States, including wetlands, with dredged or fill material, requires the issuance of a permit from the USACE (33 CFR Parts 320-330). For purposes of administering the Section 404 permit program, the USACE defines wetlands as follows:

> *Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. (33 CFR 328.3)*

The *Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1)*, issued by the USACE in 1987 states that wetlands must possess three essential characteristics. These characteristics include, under normal circumstances: 1) the presence of hydrophytic vegetation, 2) hydric soils, and 3) wetland hydrology. If all three of these criteria are present on a particular property in areas larger than one-third acre in size, then a permit (individual permit or nationwide permit) must be issued by the USACE in order to fill all or a portion of those areas. It can be generally assumed that the Thompson's Branch channel is Waters of the U.S. because it is directly connected hydraulically to Mountain Creek and the East Fork of the Trinity River.

Section 404 (b)(1) guidelines (40 CFR Part 230), established by the USEPA, constitute the substantive environmental criteria used in the evaluating activities regulated under Section 404 of the Clear Water Act. The purpose of these guidelines is to restore and maintain the chemical physical and biological integrity of waters of the United States through the control of discharge of dredged or fill material.

All property owners within the United States and its territories must adhere to the provisions of the Clean Water Act. If any contemplated activity might impact waters of the United States, including adjacent or isolated wetlands, a permit application must be made. If jurisdictional waters and/or wetlands are found to exist, then any activity which would involve filling, excavating, or dredging these wetlands would require the issuance of a permit. The final authority to determine whether or not jurisdictional waters exist lies with USACE. Any activity requiring authorization under Section 404 of the Clean Water Act will also require a Section 401 water quality certification from the TCEQ. In Texas, these regulations are administered by the TCEQ.

USACE recently reissued, on March 12, 2007, all Nationwide Permits (NWPs), general conditions and definitions with some modifications. The Corps also issued six new NWPs, two new general conditions, and 13 new definitions. General guidance is provided below for each alternative concerning whether or not NWPs apply to the proposed activity and the appropriate construction methods.

4.2 ALTERNATIVE 1

Alternative 1 involves cleaning the existing channel by cutting the vegetation growth. This alternative also assumes that the city will continue to perform regular periodic maintenance of the channel banks and bottom. The analysis described above shows that with proper maintenance the existing channel can convey the 5-yr flood event with minimal spillage. Vegetation control can usually be accomplished by mechanical or hand methods depending on permit considerations.

4.2.1 Easement Requirement

The easement required for the existing channel with a 10-foot maintenance road is approximately 80-feet wide. Total easement area requirement is approximately 7.34 acres (253,670 sq. ft.), less any existing easements already owned by the City.

4.2.2 Section 404 Permit Requirements

Section 404 Permits are administered by the U.S. Army Corps of Engineers (USACE) to regulate impacts to wetlands and other Waters of the U.S. There are several nationwide Permits that might apply to the proposed channel cleaning; however all are very restrictive in terms of dredging and filling of materials and length of channel that can be disturbed (usually a maximum of 300 feet). **Please note that USACE considers any temporary disturbance of the jurisdictional area as a loss due to dredging and filling.** If required, NWP review, coordination and approval can be estimated to take 6 to 12 months with a permitting cost of approximately $20,000.

Therefore, to avoid major problems with 404 issues the proposed cleaning must be accomplished as follows. Cleaning must not involve any mechanical operations within the limits of the Waters of the U.S. jurisdictional area. This can be generally described as the bottom of the channel up to the normal high water mark (typically located near the base of the channel sideslope). Mechanical excavation of obstructions can occur for maximum of 300 feet if done from top of bank with a bucket excavator. Mowing of side slopes is allowable, again preferably from top-of-bank and preferably 8 to 12 inches above the flow line. All grubbing of large vegetation in channel bottom must be by hand (chain saw, etc.). If no mechanical excavation or disturbance of the jurisdictional waters is proposed, then no notification of the USACE or issuance of a NWP is required.

4.2.3 Probable Construction Cost

The probable construction cost estimate including cost for nationwide permitting is **approximately $233,000.** Details of cost estimate are provided in Appendix B.

4.3 ALTERNATIVE 2

For Alternative 2, the proposed cross sections have a 50-foot wide bottom and 3:1 side slopes up to the existing grade, except in the vicinity of cross sections of RS 4901, RS 4602, RS 4101 and RS 3597 where overbank filling of approximately 0.5 to 1.5-feet deep and 80 to 170-foot wide is proposed to raise the existing grade. It is assumed that some (19 - 21%) of the excavated material can be placed and compacted as site fill near the channel. This will require additional calculations to ensure no net loss of valley storage within the Mountain Creek floodplain.

See the Exhibits mentioned below for details.

- Exhibits 4a and 4b in Appendix A for limits of the fill area mentioned.
- Exhibits 10 and 11 in Appendix A show the comparison of existing and proposed cross sections at RS 4602 and RS 3597, respectively.
- Exhibit 12 in Appendix A for typical cross section.
- Exhibit 5 in Appendix A shows the comparison of profiles for the existing and proposed channel.

From the HEC-RAS analysis for the proposed channel mentioned above, the **10-yr flood event discharge from Thompson's Branch stays predominantly inside the channel**. Without the proposed filling; some portions of the adjacent north and south overbank areas will see flooding by Thompson's Branch. Exhibit 2 of Appendix A shows the existing and proposed 10-yr floodplains. The HEC-RAS generated report for the proposed channel is provided in Appendix C. Also an electronic copy of the model is provided in a CD in Appendix D.

4.3.1 Easement Requirement

The easement required for the 50-foot wide channel with a 20-foot maintenance road is approximately 120-feet wide. Total easement area requirement is approximately 11.31 acres (492,663 sq. ft.), less any existing easements already owned by the City. See Exhibits 4a & 4b of Appendix A for existing and proposed easement locations.

4.3.2 Section 404 Permit Requirements

Any proposal to widen and reshape of the entire channel using mechanical equipment through cut and fill methods will require an Individual Section 404 Permit because of the length of the channel. An Individual Permit requires the submittal of detailed mitigation plans in addition to the proposed channel construction plans. Processing of an Individual Permit can be expected to take anywhere between 12 to 24 months for approval with 3-5 years monitoring of mitigation measures after construction. Permitting costs for this type of permit will be approximately $70,000 with mitigation costs of about $ 500,000 or more.

It is possible for Alternative 2 to be accomplished with a Nationwide Permit and potentially no permit. To accomplish this proposed widening should be "benched" above the limits of the jurisdictional waters. All mechanical excavation should be done or at least started using bucket excavators from the top and caution is required to ensure that no material be spilled into jurisdictional area. The project is considered complete on re-establishment of vegetation and completion of all mitigation measures.

The proposal to use a NWP will require additional hydraulic modeling and may slightly increase the channel top width and easement requirements noted above. The schedule for processing of a NWP is approximately 6 to 12 months assuming no significant mitigation measures are required. The permitting cost for this alternative is approximately $40,000.

4.3.3 Probable Construction Cost

The total probable construction cost estimate for Alternative 2 including a NWP with 15% contingency and 20% engineering and surveying is **approximately $1,030,000.** Details of cost estimation are provided in Appendix B.

4.4 ALTERNATIVE 3

For Alternative 3, the proposed channel is same as the channel for Alternative 2 (50-foot wide bottom channel with 3:1 side slopes), except that increased filling is proposed in the overbanks in the vicinity of cross sections RS 4901, RS 4602, RS 4101 and RS 3597. The proposed overbank fill is approximately 1.2 to 4.0-foot deep and 150 to 470-foot wide raising the existing grade along the channel to contain a larger storm event. It is assumed that 80 to 85% of the excavated material can be placed and compacted as site fill near the channel. This will require additional calculations to ensure no net loss of valley storage within the Mountain Creek floodplain.

See the Exhibits mentioned below for details.

- Exhibits 4a and 4b in Appendix A for limits of the fill area mentioned.
- Exhibits 13 and 14 in Appendix A show the comparison of existing and proposed cross sections at RS 4602 and RS 3597, respectively.
- Exhibit 15 in Appendix A for typical cross section.
- Exhibit 5 in Appendix A shows the comparison of profiles for the existing and proposed channel

From the HEC-RAS analysis for the proposed channel mentioned above, the **25-yr flood event discharge from Thompson's Branch stays predominantly inside the channel**. Without the proposed filling; portions of the north and south overbanks will see extensive flooding from this storm event on Thompson's Branch. The HEC-RAS generated report for the proposed channel is included in Appendix C. An electronic copy of the model is provided in a CD in Appendix D.

4.4.1 Easement Requirement

The easement required for the 50-foot wide channel with a 20-foot maintenance road is approximately 120-feet wide. Total easement area requirement is approximately 11.31 acres (492,663 sq. ft.), less any existing easements already owned by the City. See Exhibits 4a & 4b of Appendix A for existing and proposed easement locations.

4.4.2 Section 404 Permit Requirements

Section 404 Individual and Nationwide Permit considerations, costs and schedules are the same as described above for Alternative 2 in Section 4.3.2.

4.4.3 Probable Construction Cost

The total probable construction cost estimate for Alternative 3, including a NWP, with 15% contingency and 20% engineering and surveying is **approximately $960,000**. Details of the cost estimation are provided in Appendix B.

4.5 ALTERNATIVE 4

For Alternative 4, the proposed channel cross sections have a 90-foot wide bottom and 3:1 side slopes extending to the existing grade, except in the vicinity of cross sections of RS 4901, RS 4602, RS 4101 and RS 3597 where overbanks are to be filled approximately 1.0 to 1.5-foot deep and 120 to 450-foot wide. This fill is proposed to raise the existing adjacent grade to contain the desired flow capacity. It is assumed that some (13 – 15%) of the excavated material can be placed and compacted as site fill near the channel. This will require additional calculations to ensure no net loss of valley storage within the Mountain Creek floodplain.

See the Exhibits mentioned below for details.

- Exhibits 4a and 4b in Appendix A for limits of the fill area mentioned.
- Exhibits 16 and 17 in Appendix A show the comparison of existing and proposed cross sections at RS 4602 and RS 3597, respectively.
- Exhibit 18 in Appendix A for typical cross section.
- Exhibit 5 in Appendix A shows the comparison of profiles for the existing and proposed channel

From the HEC-RAS analysis for the proposed channel mentioned above, the **100-yr flood event discharges from Thompson's Branch stays predominantly inside the channel**. Without the proposed filling potions of the north and south overbanks will see flooding by Thompson's Branch. Exhibit 3 of Appendix A shows the existing and proposed 100-yr floodplains. The HEC-RAS generated report for the proposed channel is included in Appendix C. Also, an electronic copy of the model is provided in the CD in Appendix D.

4.5.1 Easement Requirement

The easement required for the 90-foot wide channel with a 20 foot maintenance road is approximately 150-feet wide. The total easement area requirement is approximately 14.70 acres (640,332 sq. ft.), less any existing easements already owned by the City. See Exhibits 4a and 4b of Appendix A for existing and proposed easement locations.

4.5.2 Section 404 Permit Requirements

Section 404 Individual and Nationwide Permit considerations, costs and schedules are similar to that described above for Alternative 2 in Section 4.3.2.

4.5.3 Probable Construction Cost

The total probable construction cost estimate, including a NWP, for Alternative 4 with 15% contingency and 20% engineering and surveying is **approximately $ 1,950,000**. Details of the cost estimation are provided in Appendix B.

4.6 ALTERNATIVE 5

For Alternative 5, the proposed channel improvements consist of a 50-foot wide bottom and 3:1 side slopes up to the existing grade. The proposed channel is a concrete-lined channel with 8-inch thick concrete for both channel bottom and side slopes.

See the Exhibits mentioned below for details.

- Exhibits 4a and 4b in Appendix A for limits of the fill area mentioned.
- Exhibits 19 and 20 in Appendix A show the comparison of existing and proposed cross sections at RS 4602 and RS 3597, respectively.
- Exhibit 21 in Appendix A for typical cross section.
- Exhibit 5 in Appendix A shows the comparison of profiles for the existing and proposed channel

From the HEC-RAS analysis for the proposed channel mentioned above, the **100-yr flood event discharge from Thompson's Branch stays predominantly inside the channel**. See Exhibit 3 of Appendix A for the existing and proposed 100-yr floodplains. The HEC-RAS generated report for the proposed channel is provided in Appendix C. An electronic copy of the model is provided in a CD in Appendix D.

4.6.1 Easement Requirement

The easement required for the 50-foot wide channel with a 20-foot maintenance road is approximately 110-feet wide. The total easement area that needs to be acquired is approximately 10.16 acres (442,570 sq. ft.), less any existing easements already owned by the City. See Exhibits 4a and 4b of Appendix A for existing and proposed easement locations.

4.6.2 Section 404 Permit Requirements

Any proposal to widen and reshape of the entire channel using mechanical equipment through cut and fill methods and replace the vegetation with a concrete lined channel will require an Individual Section 404 Permit. An Individual Permit of this nature is difficult to receive approval for and requires the submittal of extensive detailed mitigation plans in addition to the proposed channel construction plans. Processing of the Individual Permit can be expected to take at least 24 months for approval with 3-5 years monitoring of mitigation measures after construction. Permitting costs for this type of permit if it does receive approval are approximately $100,000 with mitigation costs of approximately $1,000,000.

It is unlikely that this option will receive an Individual Permit, since it involves complete modification of channel and total loss of jurisdictional waters.

4.6.3 Probable Construction Cost

The total probable construction cost estimate for Alternative 5, including a Section 404 Permit, with 15% contingency and 20% engineering and surveying is **approximately $ 5,470,000**. Details of the cost estimation are provided in Appendix B.

4.7 SUMMARY OF ALTERNATIVES COMPARISION

The following table summarizes the differences in the five proposed alternatives for the Thompson's Branch channel. Note that the level of protection provided is not the same for all alternatives. Alternatives 4 and 5 provide the highest level of protection, up to the local 100-year design storm. However, this level of protection may not provide the greatest benefit because of impacts from Mountain Creek. As noted previously, the 100-year floodplain for Mountain Creek inundates all of the Thompson's Branch channel and most of the overbank areas along the channel.

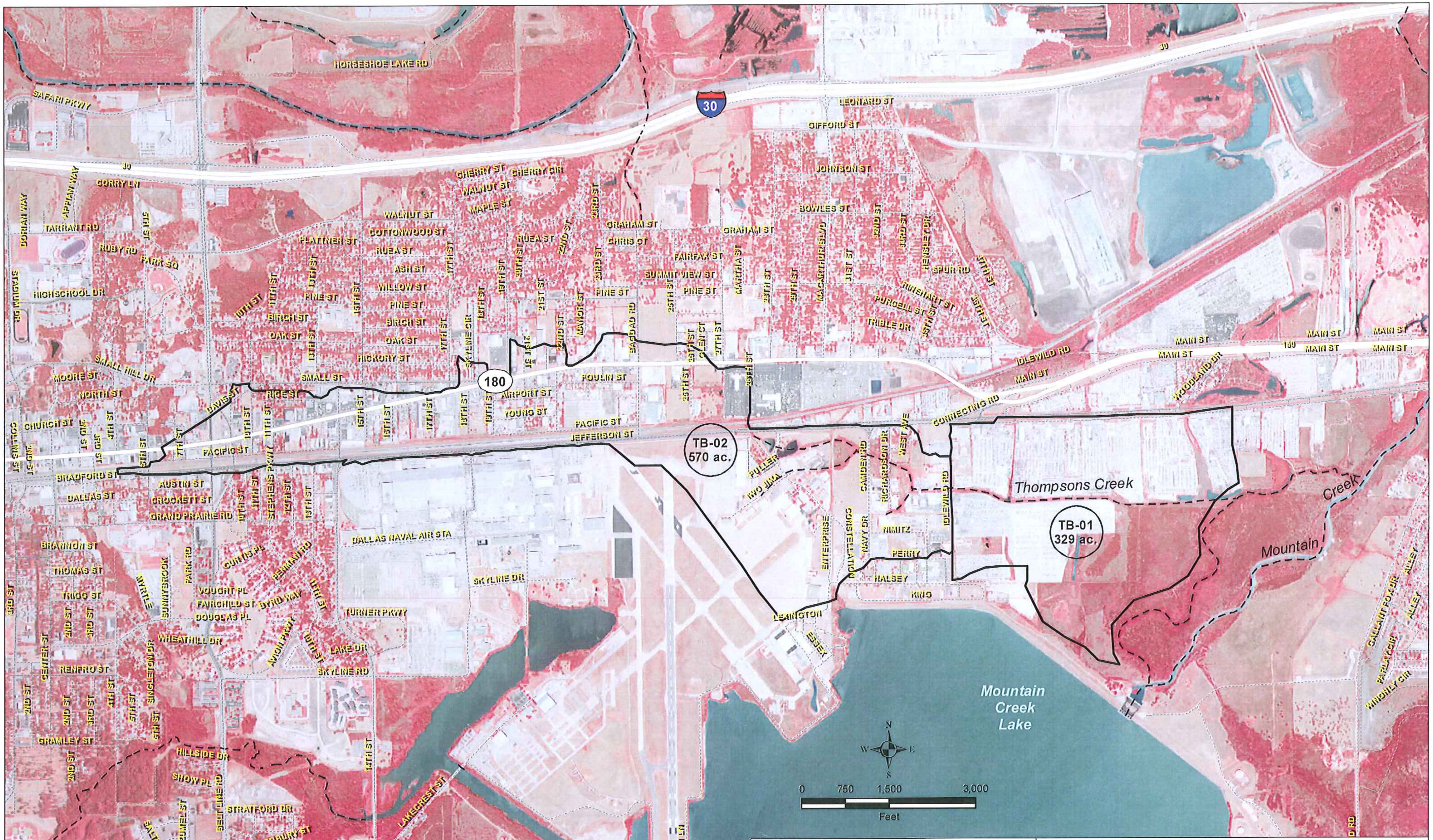
Table 7. Alternatives Comparison Table

Alternative No	Channel Type	Bottom Width (ft)	Side Slopes (H:V)	Easement Required (Acres)	Design Event	404 Permit Requirement	Approx Time for Permit Procurement	Total Probable Construction Cost ($)
1 *	Earthen	20 to 30	3:1	NA	5 Yr	Nationwide Permit	6 to 12 months	**$233,000**
2	Earthen	50	3:1	11.31	10 Yr	Nationwide Permit	6 to 12 months	**$1,030,000**
3	Earthen	50	3:1	11.31	25 Yr	Nationwide Permit	6 to 12 months	**$960,000**
4	Earthen	90	3:1	14.70	100 Yr	Nationwide Permit	6 to 12 months	**$1,950,000**
5	Concrete	50	3:1	10.16	100 Yr	Individual permit	24 months	**$5,470,000**

* Alternative 1 is cleaning and periodic maintenance of existing channel.

Based on the detailed analysis and discussion provided above, EC recommends that the City consider Alternative 3 using construction techniques that will qualify for a Nationwide Section 404 Permit. Again, it is important to note that the analysis described herein is for the localized flow conditions from Thompson's Branch only. Even with the improvements discussed above the Thompson's Branch channel and adjacent properties will remain within the 100-year floodplain of Mountain Creek.

APPENDIX A
EXHIBITS



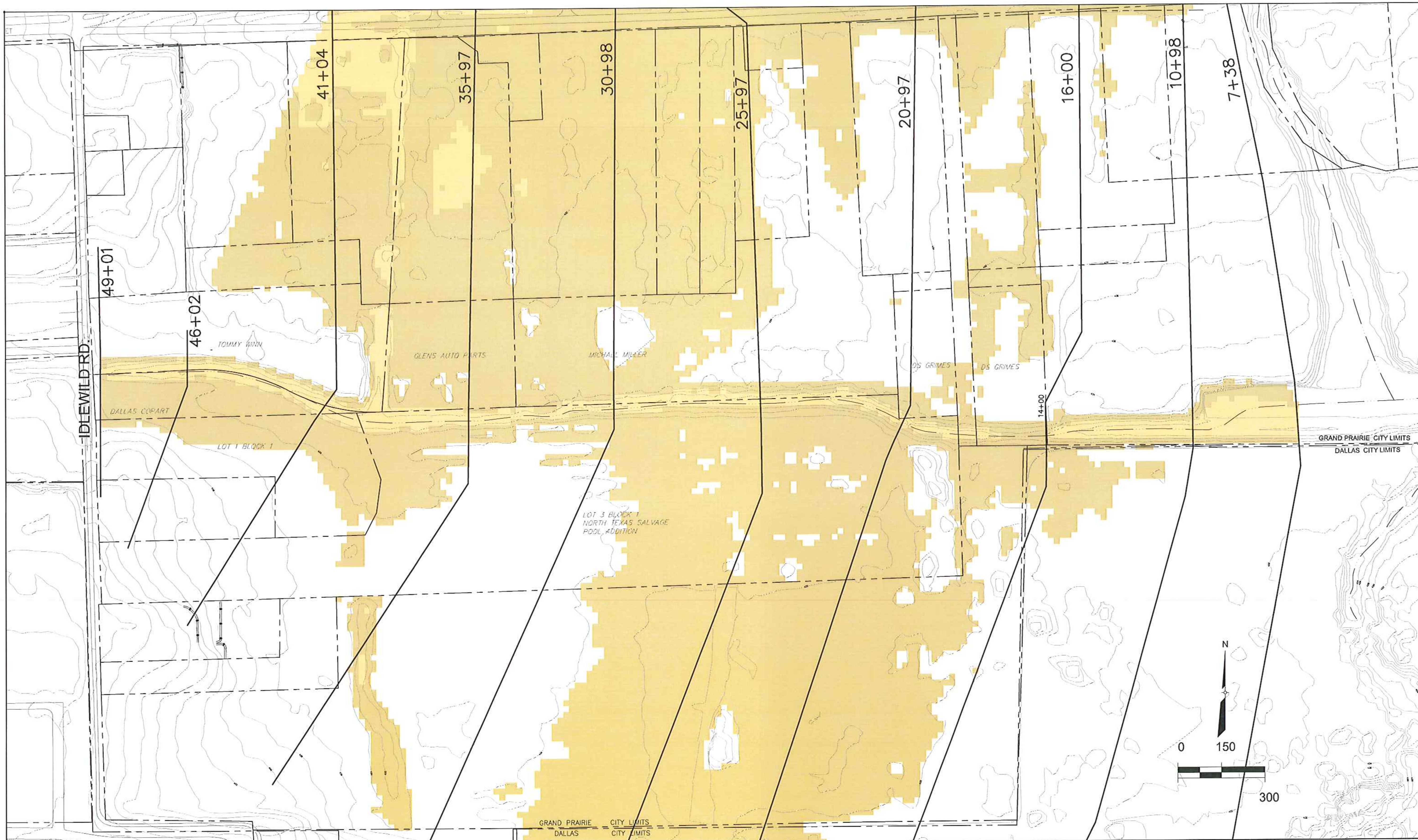
Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT #1
DRAINAGE AREA MAP
THOMPSONS BRANCH CONCEPTUAL ANALYSIS

MAY 23, 2007

PROJECT #6028

P:\active\6028 Mountain Creek Flood Protection\GIS\exh\6028exh-Thompsons_Branch_Drainage_Area_Map.mxd



EXISTING CHANNEL W/ 10-YR FLOODPLAIN

PROP 50 FT BOTTOM WIDTH CHANNEL W/ 10-YR

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Environmental & Engineering Services

EXHIBIT 2

THOMPSON'S BRANCH CONCEPTUAL ANALYSIS

10-YR EXISTING AND PROPOSED FLOODPLAINS

MAY 2007

PROJECT NUMBER 6028.101

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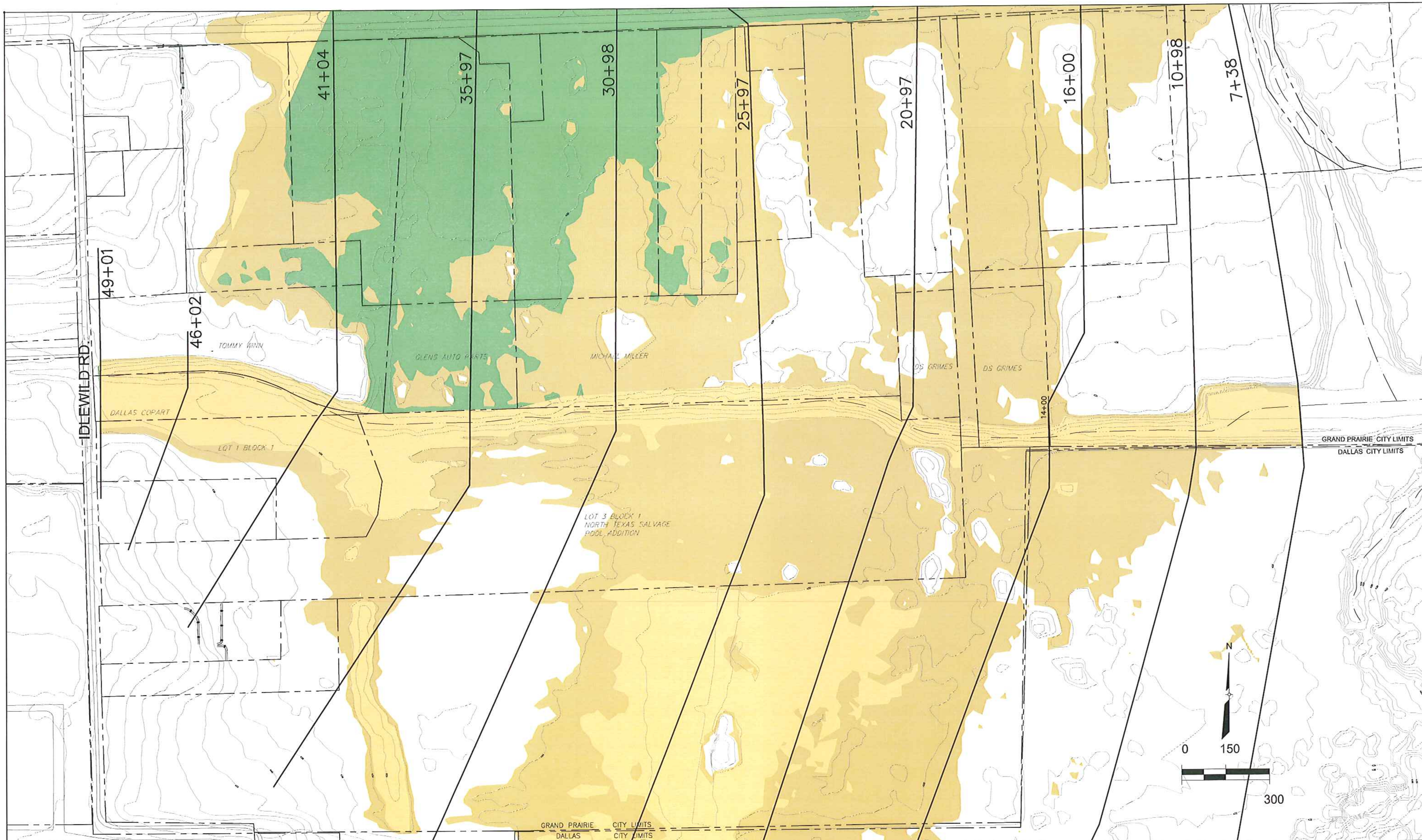

EXISTING CHANNEL W/ 100-YR FLOODPLAIN

PROP 90 FT BOTTOM WIDTH CHANNEL W/ 100-YR

PROP 50 FT BOTTOM WIDTH CONCRETE CHANNEL W/ 100-YR

EC Espey Consultants, Inc.

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EXHIBIT 3

THOMPSON'S BRANCH CONCEPTUAL ANALYSIS

100-YR EXISTING AND PROPOSED FLOODPLAINS

MAY 2007

PROJECT NUMBER 6028.101

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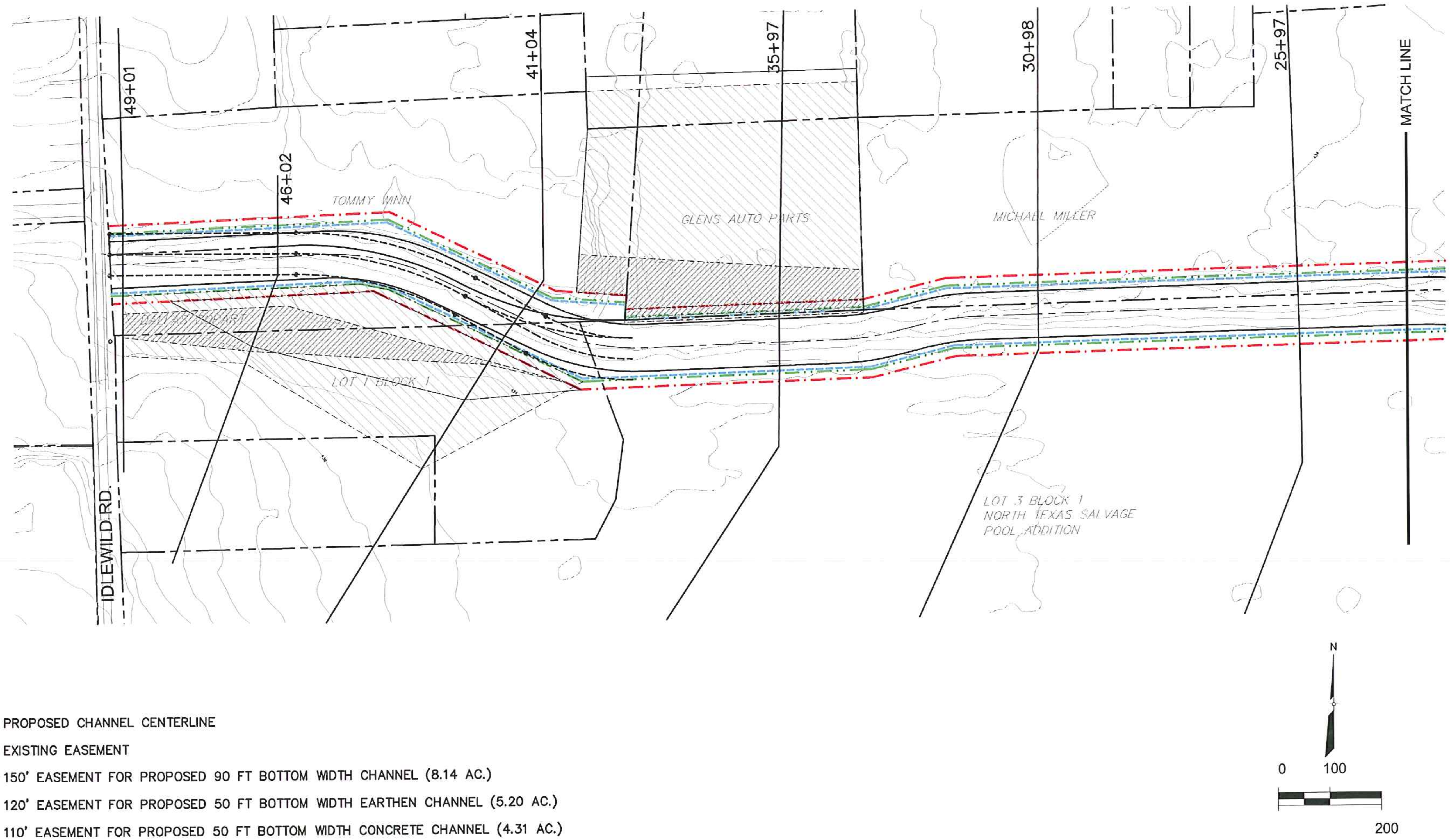

PROPOSED CHANNEL CENTERLINE

EXISTING EASEMENT

150' EASEMENT FOR PROPOSED 90 FT BOTTOM WIDTH CHANNEL (8.14 AC.)

120' EASEMENT FOR PROPOSED 50 FT BOTTOM WIDTH EARTHEN CHANNEL (5.20 AC.)

110' EASEMENT FOR PROPOSED 50 FT BOTTOM WIDTH CONCRETE CHANNEL (4.31 AC.)

FILL AREA FOR PROPOSED 50 FT BOTTOM WIDTH EARTHEN CHANNEL 10-YEAR DESIGN, ALTERNATIVE 2

FILL AREA FOR PROPOSED 50 FT BOTTOM WIDTH EARTHEN CHANNEL 25-YEAR DESIGN, ALTERNATIVE 3

FILL AREA FOR PROPOSED 90 FT BOTTOM WIDTH CHANNEL 100-YEAR DESIGN, ALTERNATIVE 4

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EXHIBIT 4A

THOMPSON'S BRANCH CONCEPTUAL ANALYSIS

PROPOSED DRAINAGE EASEMENT

JUNE 2007

PROJECT NUMBER 6028.101

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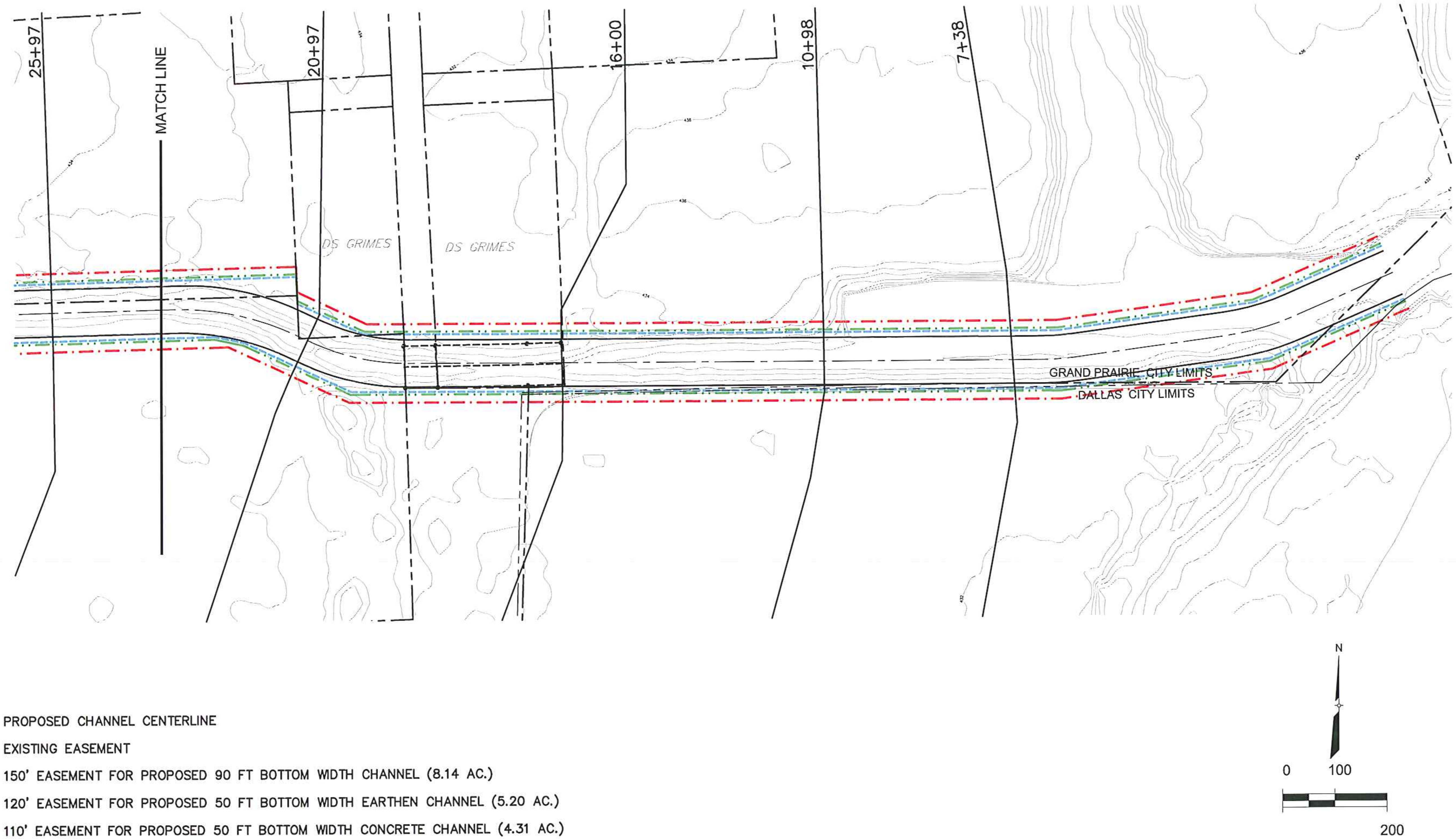

PROPOSED CHANNEL CENTERLINE

EXISTING EASEMENT

150' EASEMENT FOR PROPOSED 90 FT BOTTOM WIDTH CHANNEL (8.14 AC.)

120' EASEMENT FOR PROPOSED 50 FT BOTTOM WIDTH EARTHEN CHANNEL (5.20 AC.)

110' EASEMENT FOR PROPOSED 50 FT BOTTOM WIDTH CONCRETE CHANNEL (4.31 AC.)

FILL AREA FOR PROPOSED 50 FT BOTTOM WIDTH EARTHEN CHANNEL 10-YEAR DESIGN, ALTERNATIVE 2

FILL AREA FOR PROPOSED 50 FT BOTTOM WIDTH EARTHEN CHANNEL 25-YEAR DESIGN, ALTERNATIVE 3

FILL AREA FOR PROPOSED 90 FT BOTTOM WIDTH CHANNEL 100-YEAR DESIGN, ALTERNATIVE 4

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EXHIBIT 4B

THOMPSON'S BRANCH CONCEPTUAL ANALYSIS

PROPOSED DRAINAGE EASEMENT

MAY 2007

PROJECT NUMBER 6028.101

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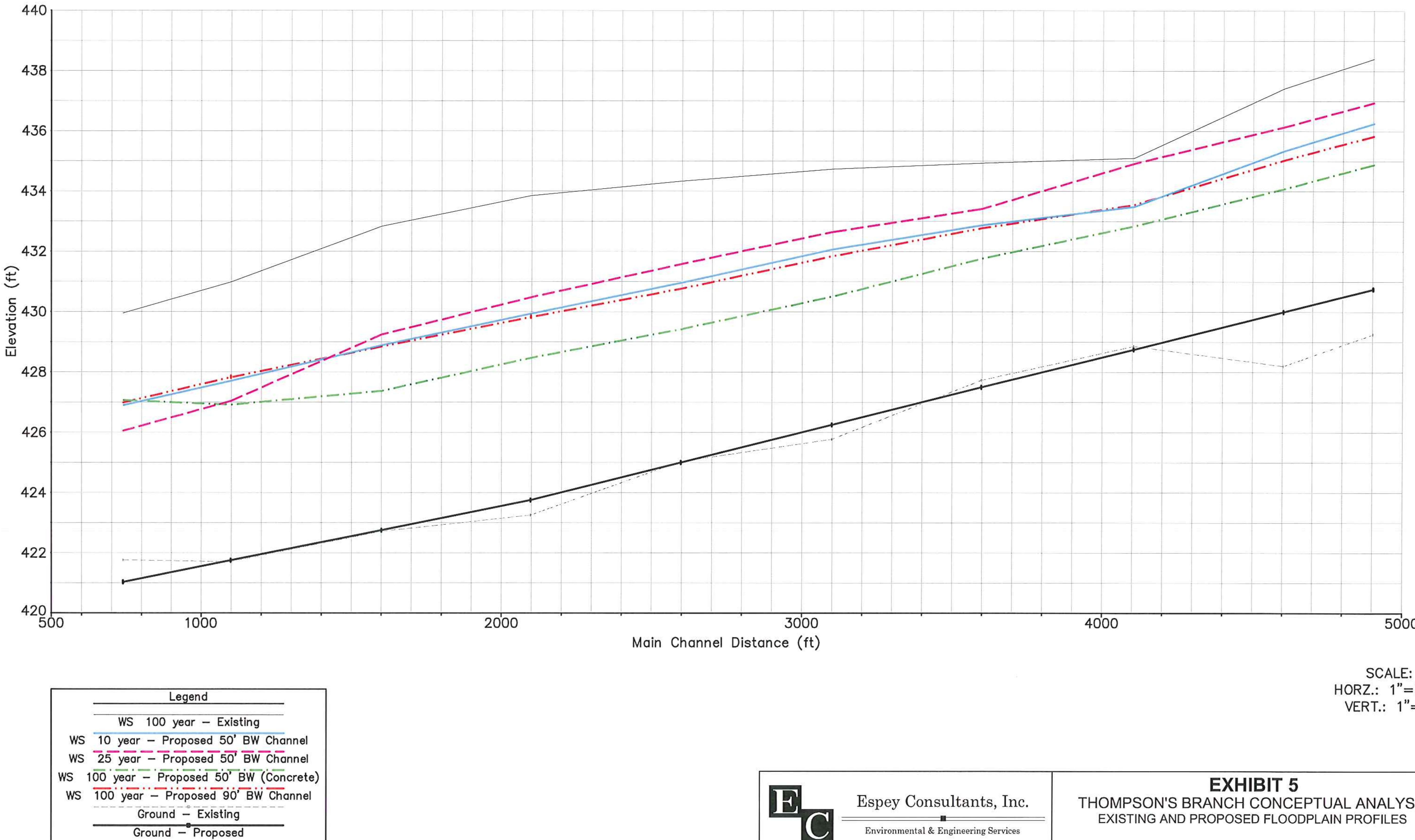

SCALE:
HORZ.: 1"=300'
VERT.: 1"=3'

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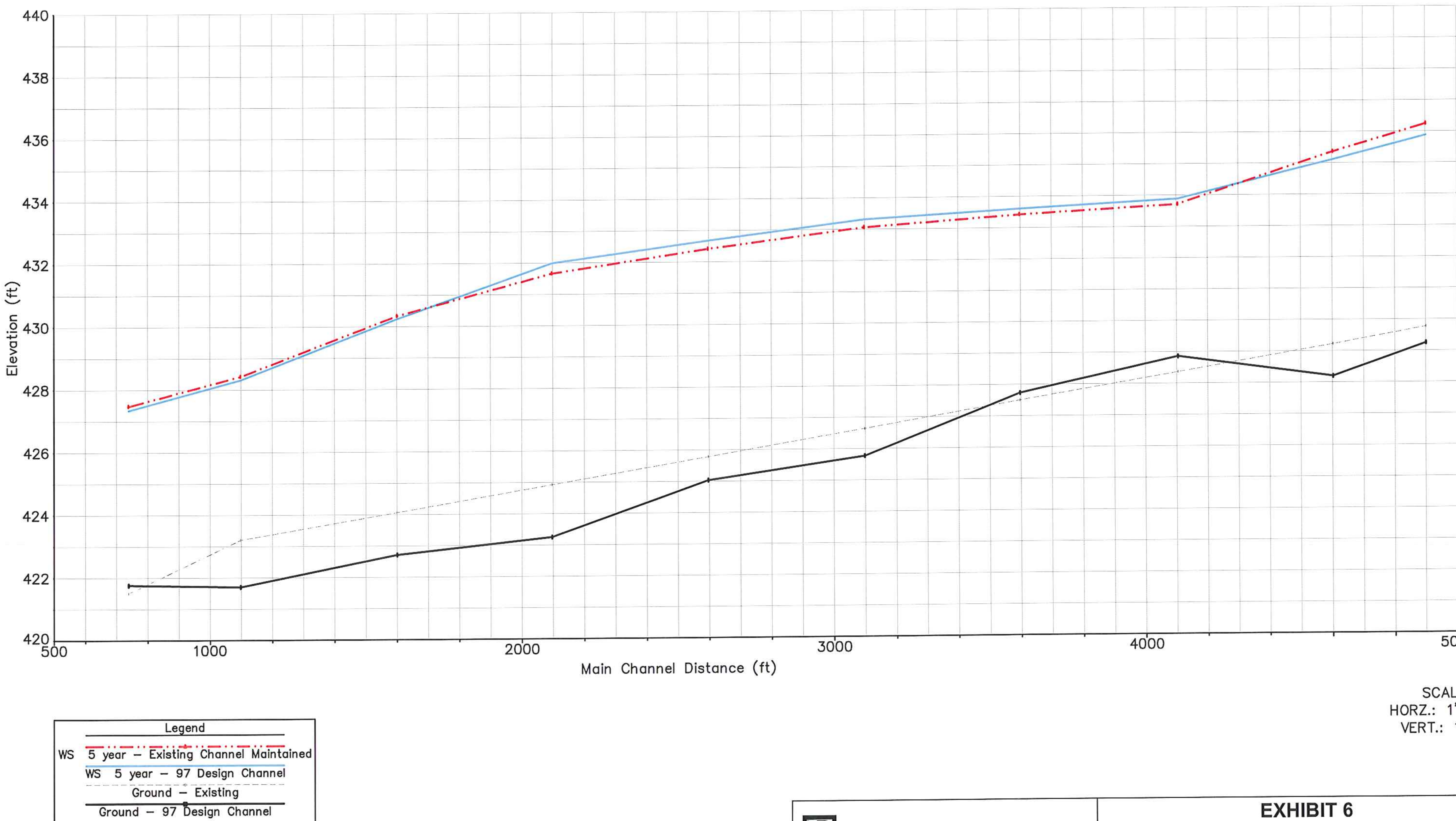
EXHIBIT 5

THOMPSON'S BRANCH CONCEPTUAL ANALYSIS

EXISTING AND PROPOSED FLOODPLAIN PROFILES

JUNE 2007

PROJECT NUMBER 6028.101



SCALE:
HORZ.: 1"=300'
VERT.: 1"=3'

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EXHIBIT 6

THOMPSON'S BRANCH CONCEPTUAL ANALYSIS
EXISTING CHANNEL MAINTAINED AND 97 DESIGN CHANNEL FLOODPLAIN PROFILES

JUNE 2007

PROJECT NUMBER 6028.101

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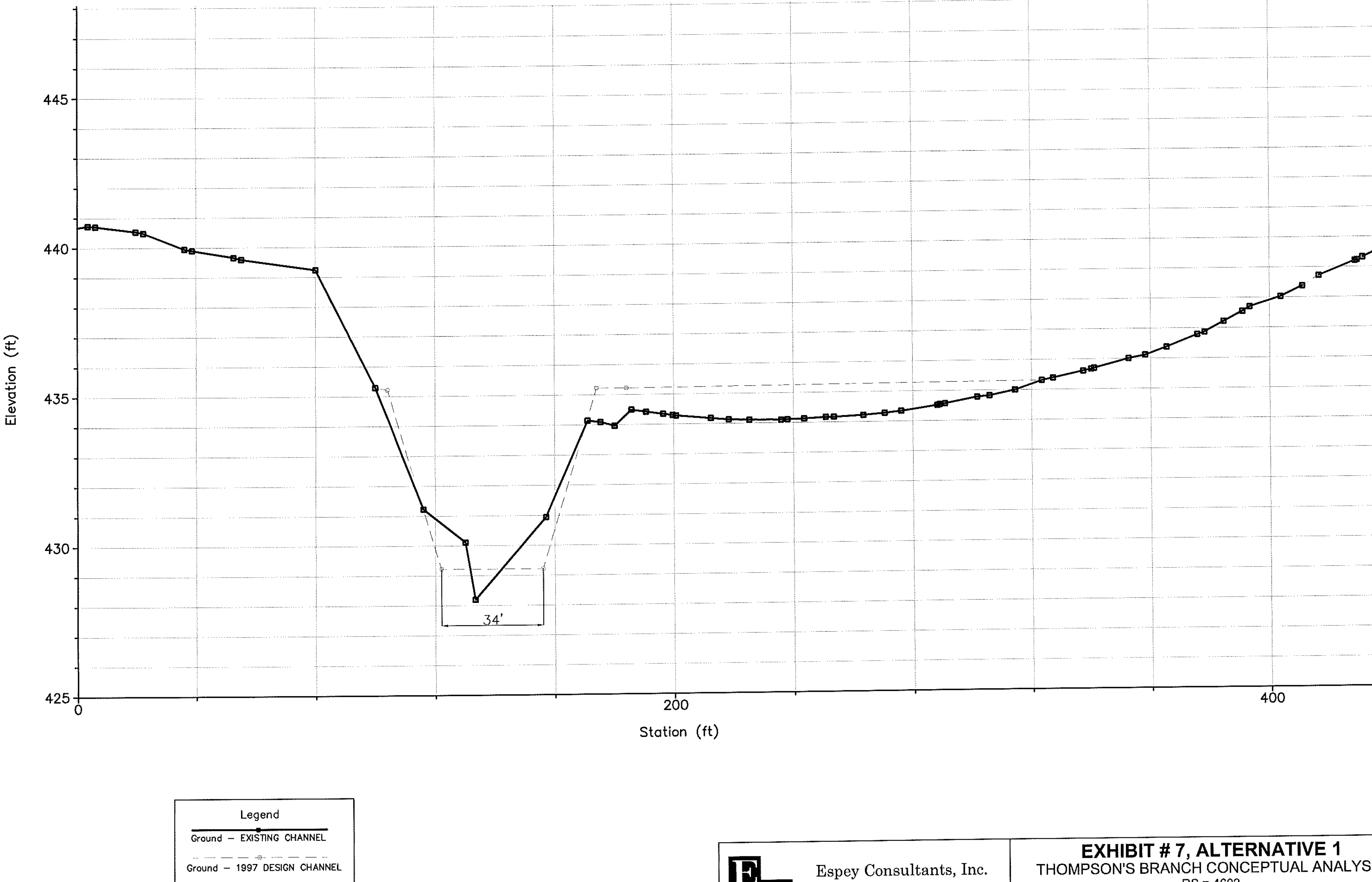

SCALE: 1" = 30'

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EXHIBIT # 7, ALTERNATIVE 1
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS
RS = 4602
MAINTAINING EXISTING CHANNEL

DATE: 6/27/2007

EC PROJECT # 6028

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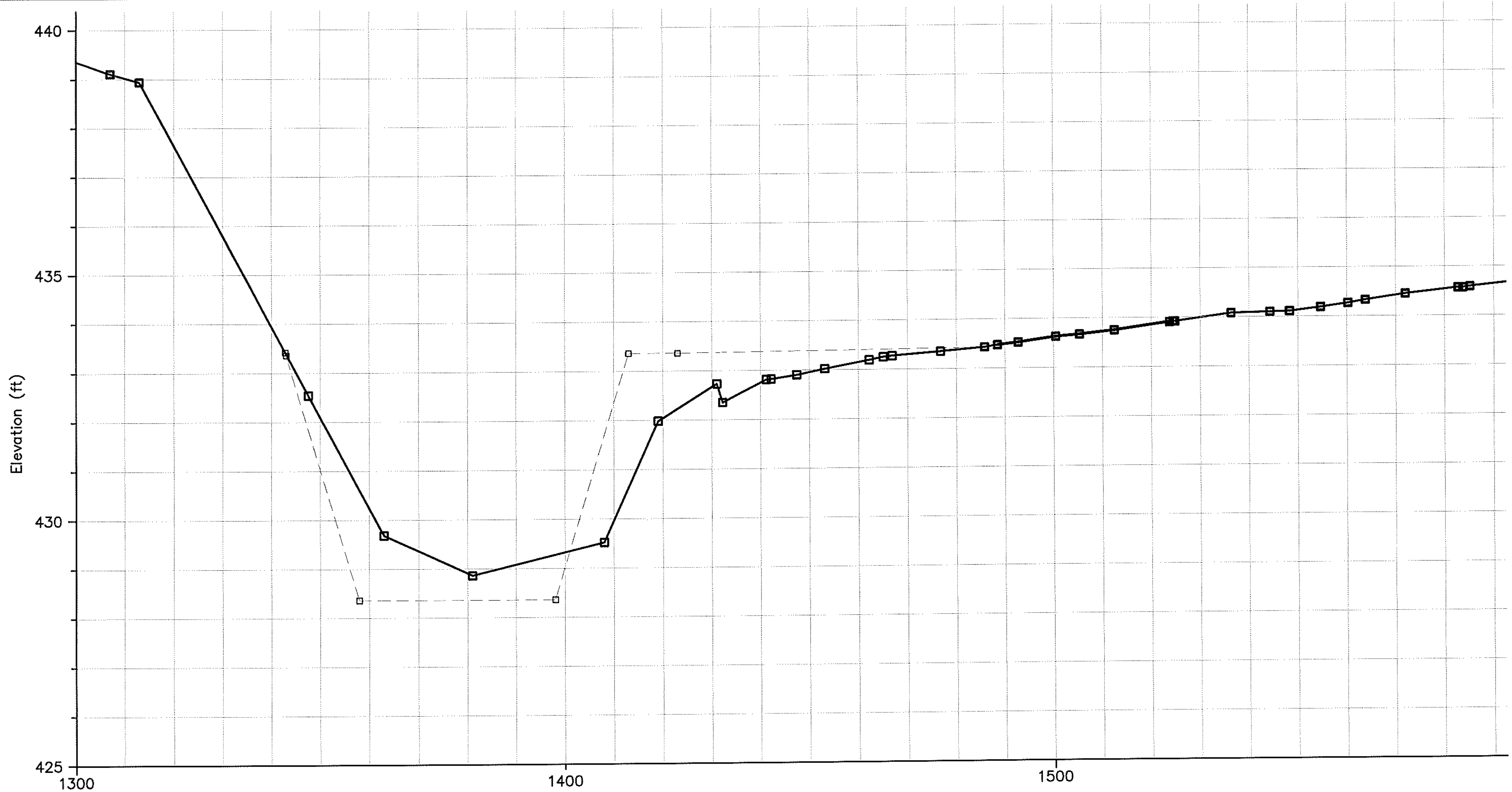

Legend

Ground – 1997 DESIGN CHANNEL

Ground – EXISTING CHANNEL

SCALE: 1" = 20'

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EXHIBIT # 8, ALTERNATIVE 1

THOMPSON'S BRANCH CONCEPTUAL ANALYSIS

RS = 4104

MAINTAINING EXISTING CHANNEL

DATE: 6/27/2007

EC PROJECT # 6028

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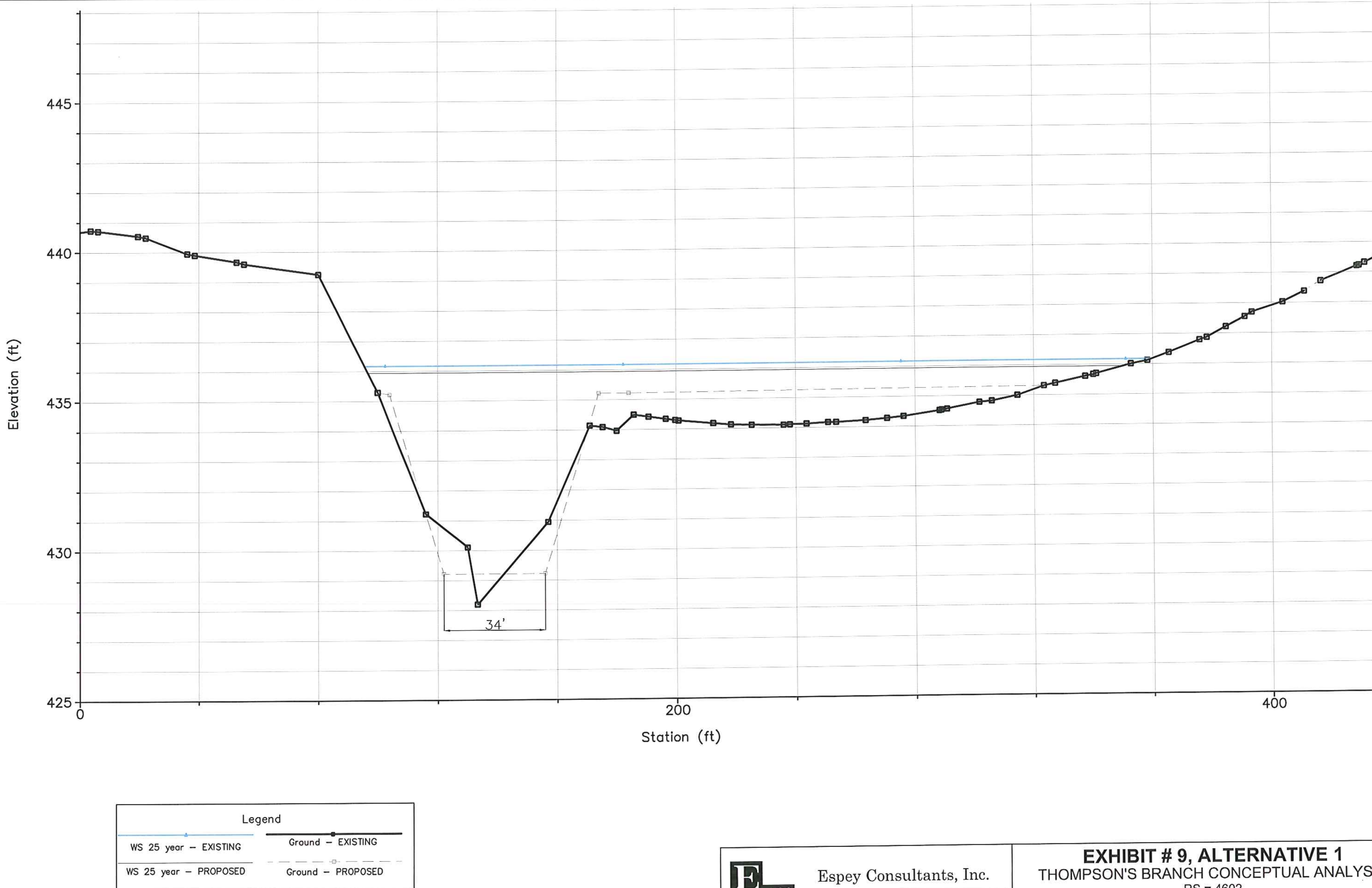

SCALE: 1" = 30'

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EXHIBIT # 9, ALTERNATIVE 1
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS
RS = 4602
MAINTAINING EXISTING CHANNEL

DATE: 6/27/2007

EC PROJECT # 6028

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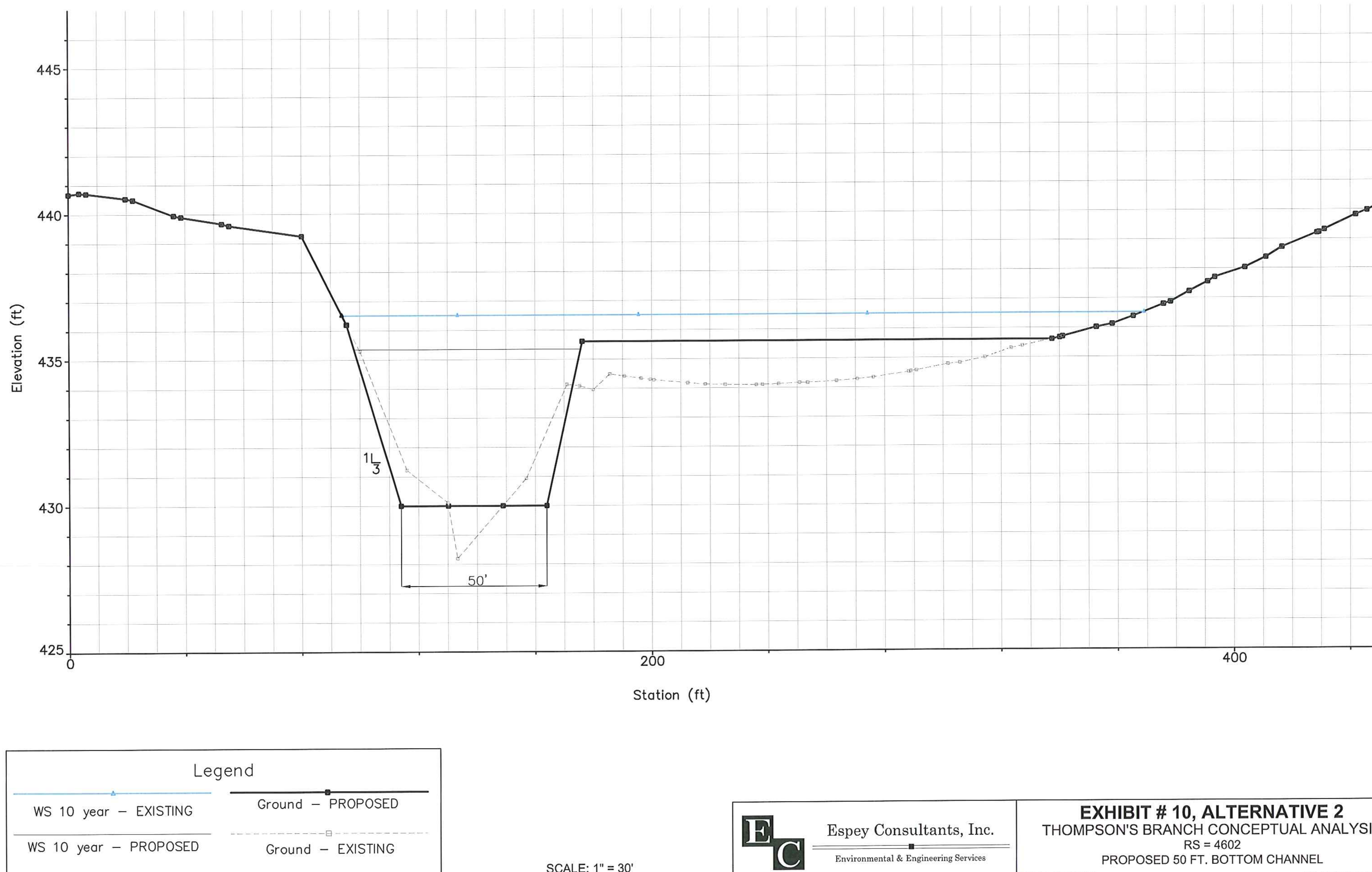

SCALE: 1" = 30'

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EXHIBIT # 10, ALTERNATIVE 2
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS
RS = 4602
PROPOSED 50 FT. BOTTOM CHANNEL
DATE: 5/22/2007
EC PROJECT # 6028

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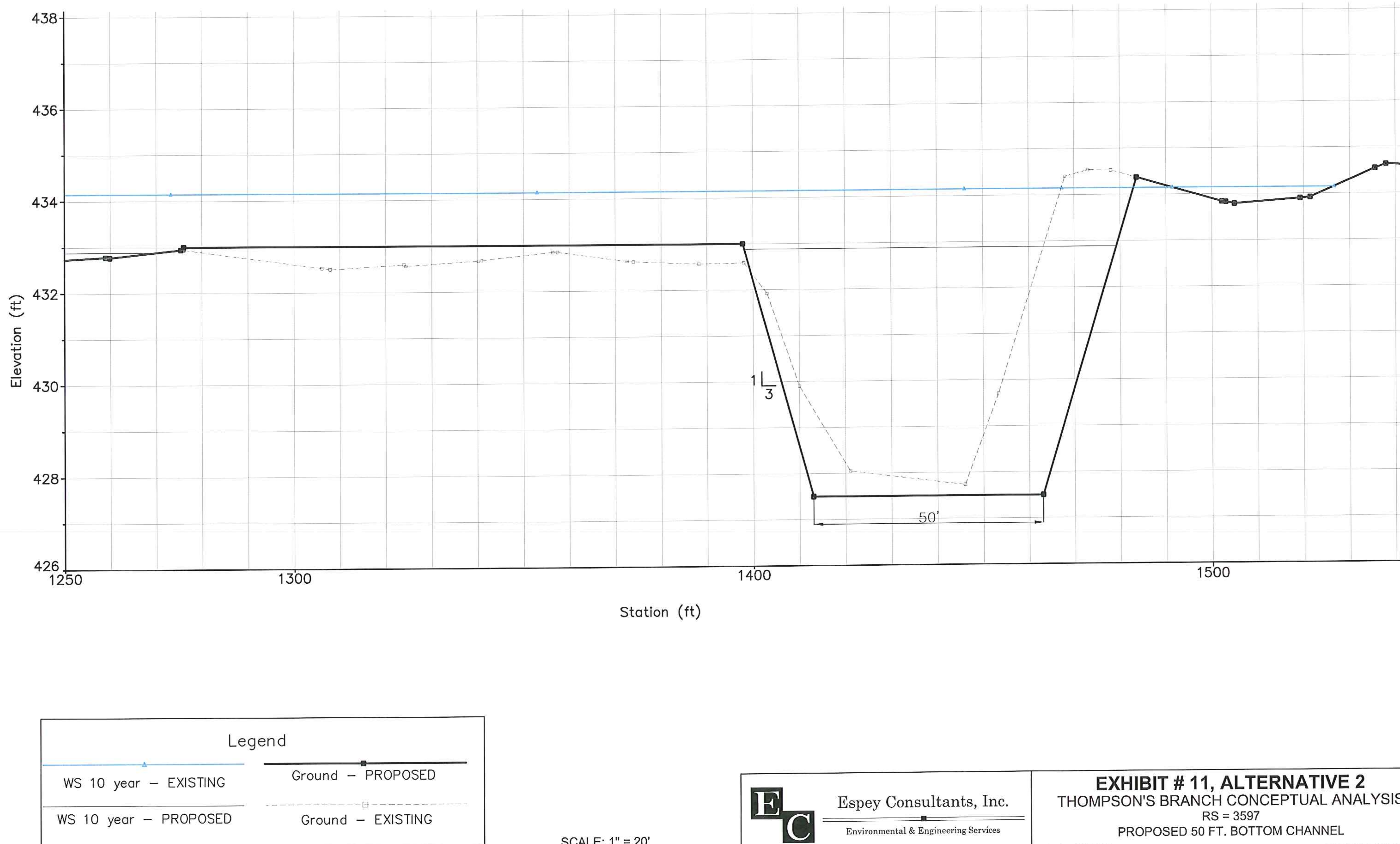

SCALE: 1" = 20'

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT # 11, ALTERNATIVE 2
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS
RS = 3597
PROPOSED 50 FT. BOTTOM CHANNEL

DATE: 5/22/2007

EC PROJECT # 6028

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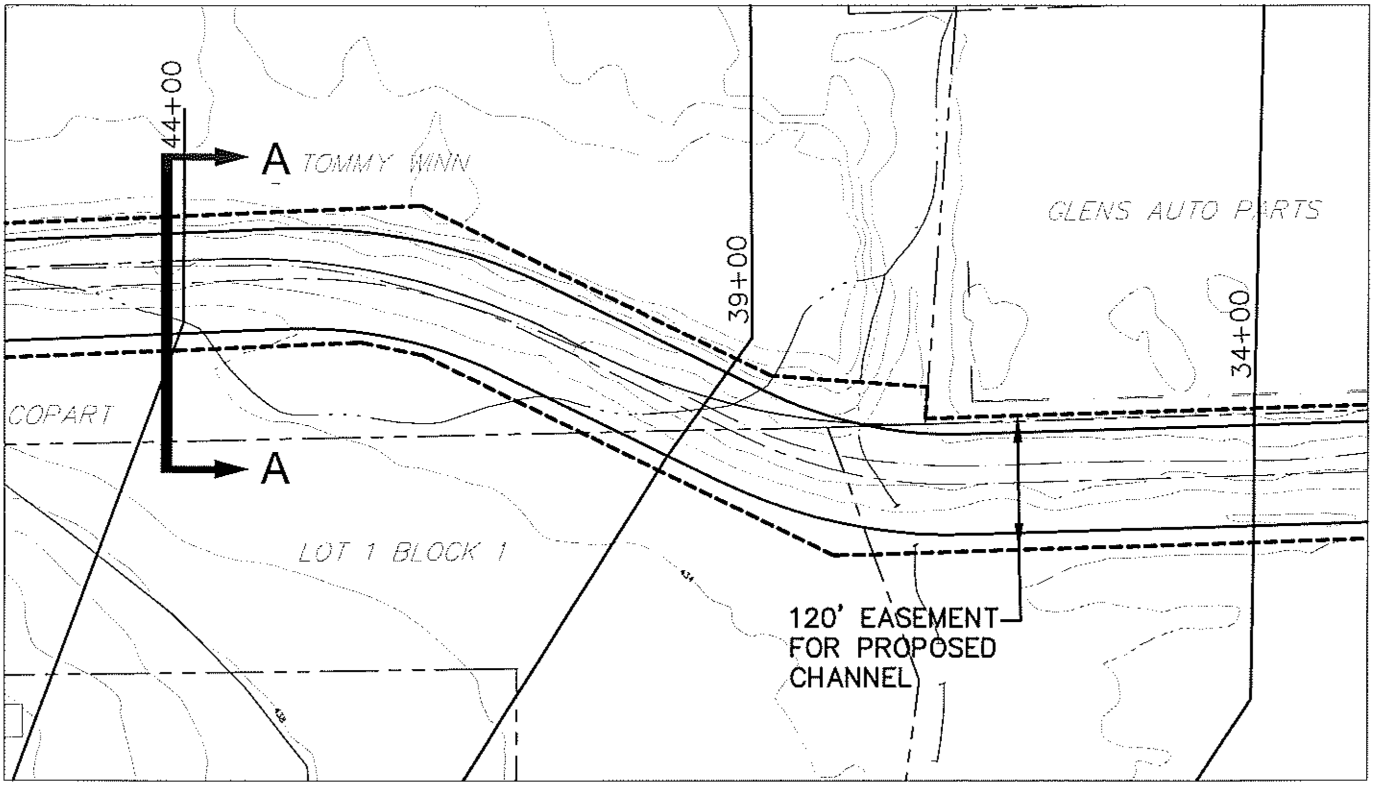
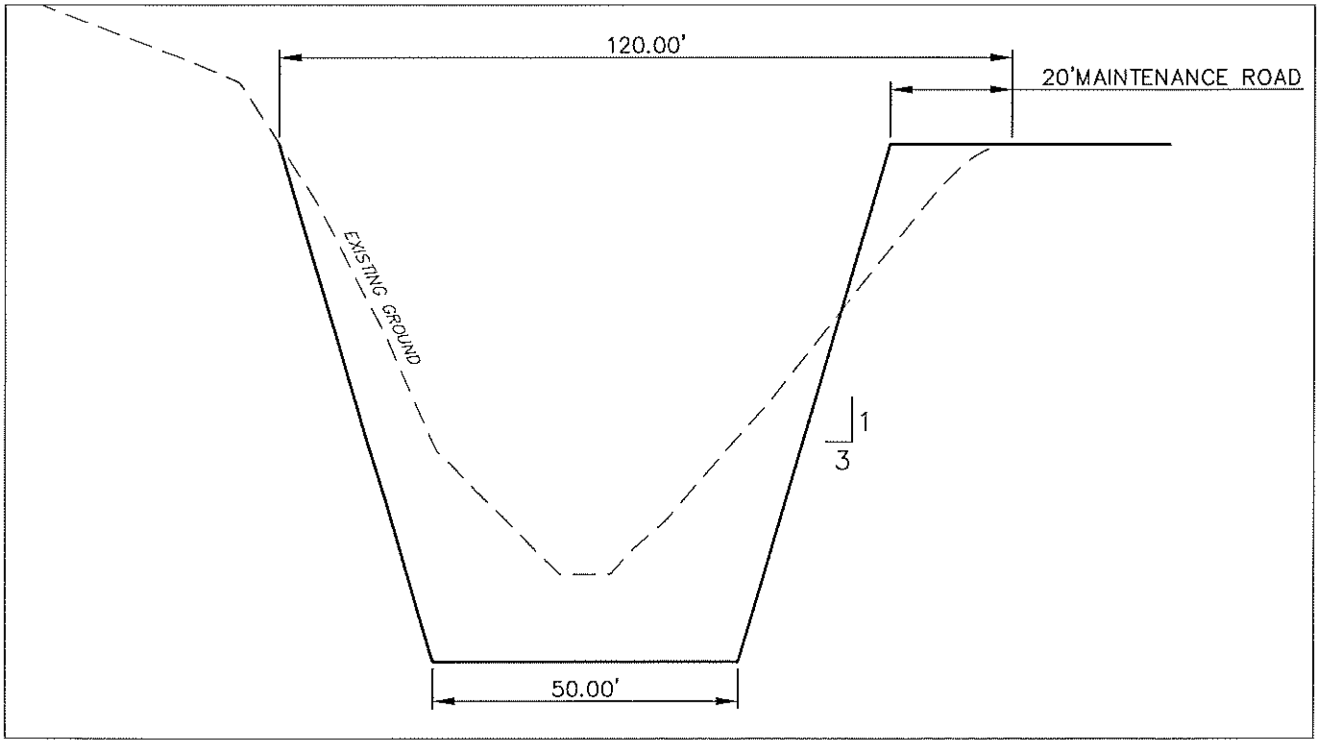




SECTION A-A (10 YEAR TYPICAL 50' BW EARTHEN CHANNEL)

SCALE 1"=30' H, 1"=3' V

Espey Consultants, Inc.

Environmental & Engineering Services

EXHIBIT 12, ALTERNATIVE 2

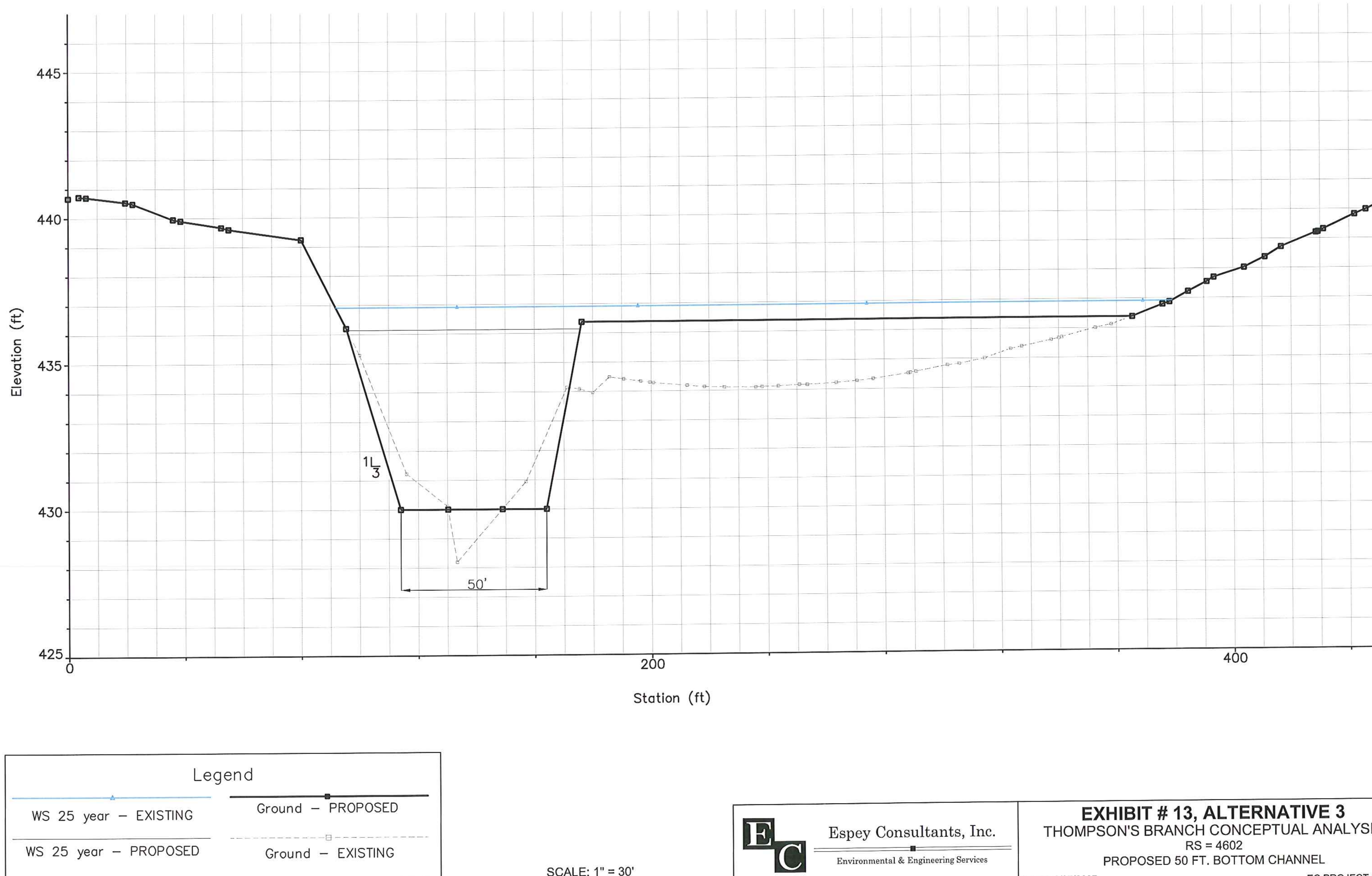
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS

PROPOSED 50' BOTTOM WIDTH EARTHEN CHANNEL

MAY 2007

EC PROJECT 6028.101

P:\active\6028 Mountain Creek Flood Protection\CADD-6028\dwg\exh_cross_section\6028exh_TYP_XSECTIONS.dwg, 50 FT BW EARTHEN CHANNEL, 6/27/2007 3:47:08 PM, bking, 1:1



SCALE: 1" = 30'

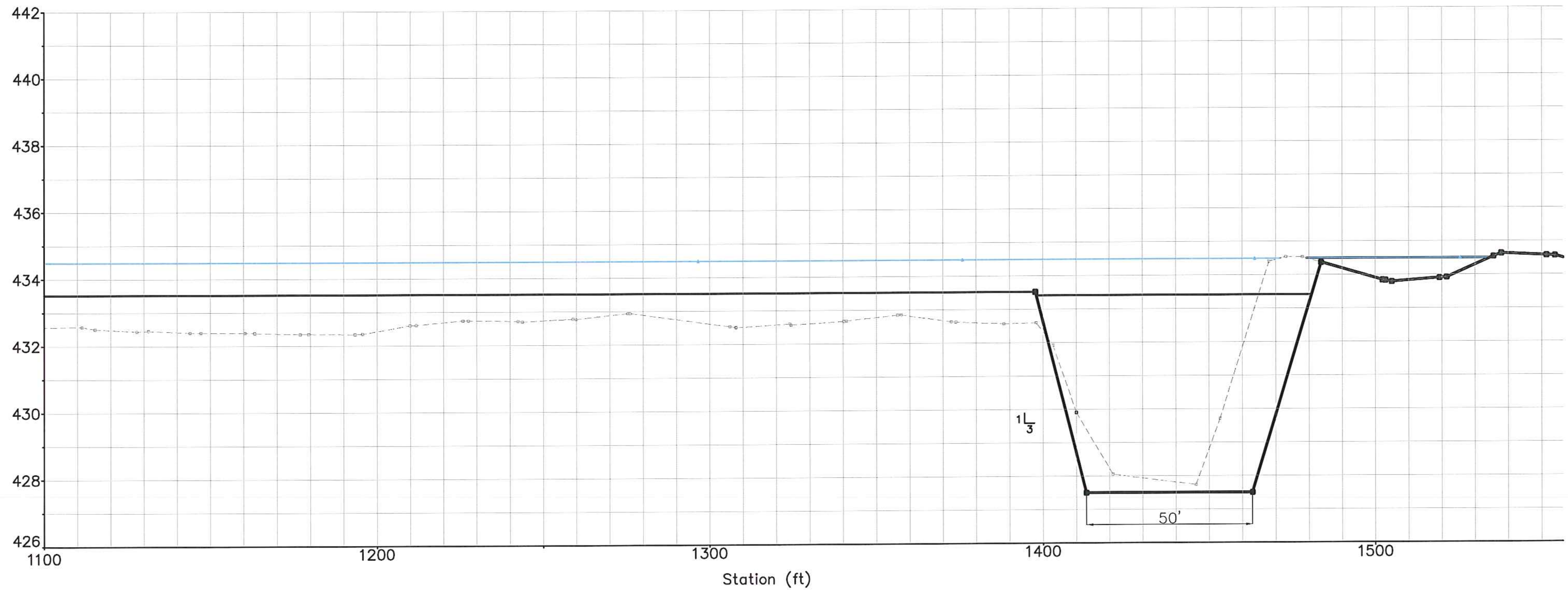
Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT # 13, ALTERNATIVE 3
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS
RS = 4602
PROPOSED 50 FT. BOTTOM CHANNEL

DATE: 6/27/2007

EC PROJECT # 6028

P:\active\6028 Mountain Creek Flood Protection\CADD-6028\dwg\exh_cross_section\6028exh_25yr_RS4602.dwg, 11x17 (Exhibit) Misc, 6/28/2007 11:16:21 AM, bking, 1:1



Legend

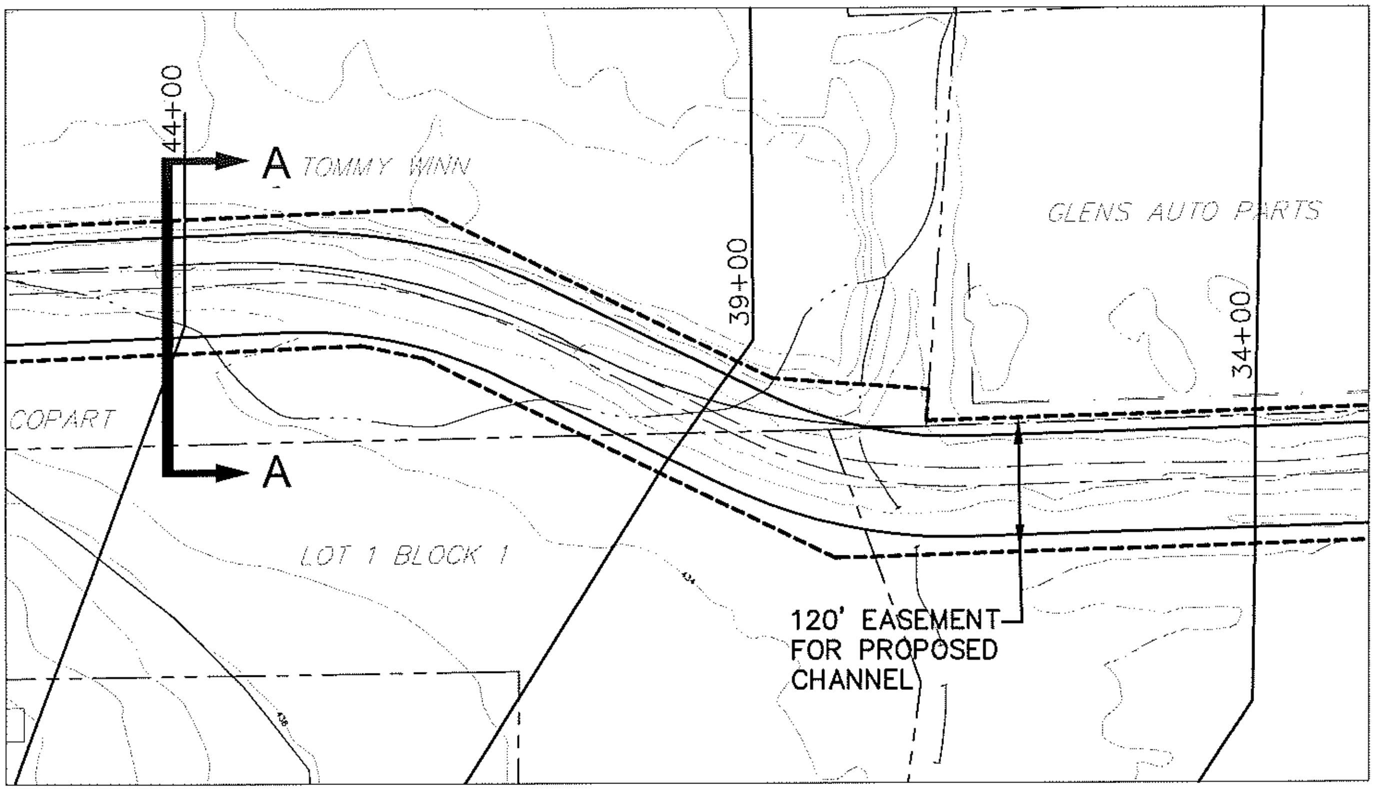
WS 25 year – EXISTING	Ground – PROPOSED
WS 25 year – PROPOSED	Ground – EXISTING

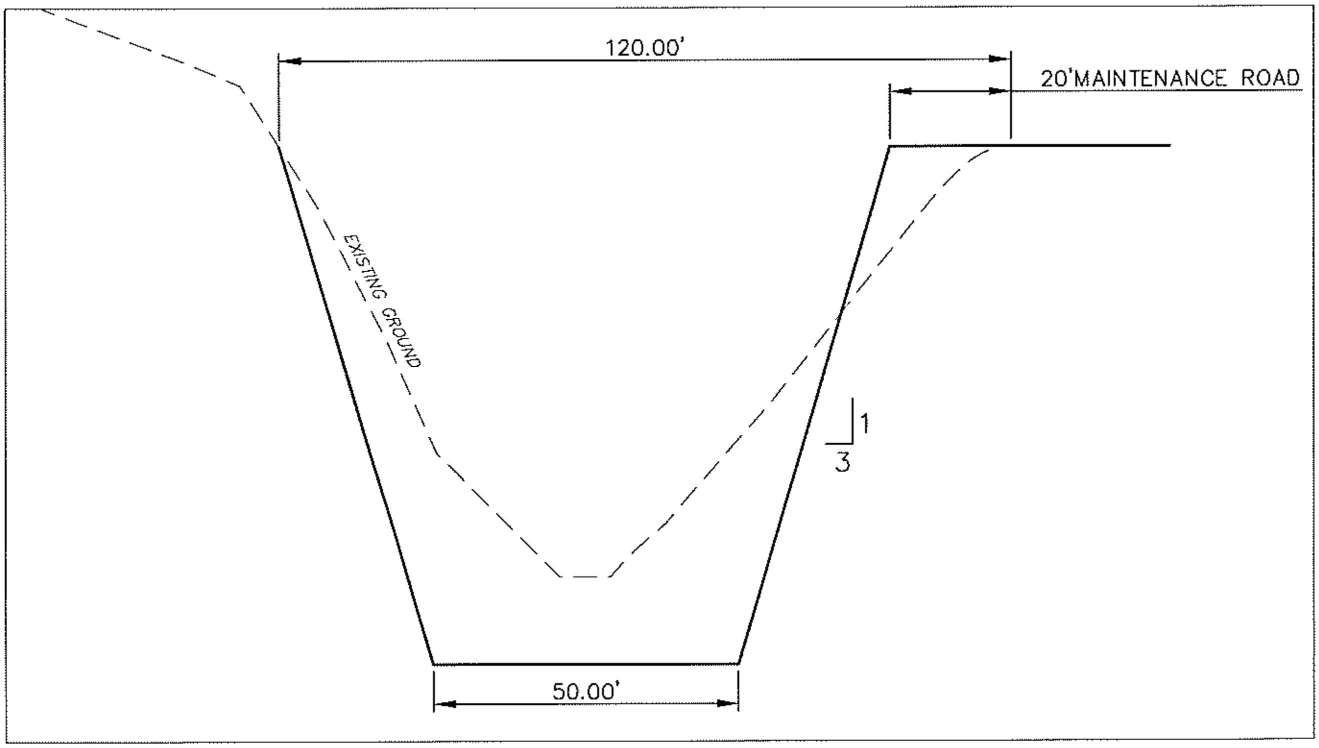
SCALE: 1" = 30'

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT # 14, ALTERNATIVE 3
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS
RS = 3597
PROPOSED 50 FT. BOTTOM CHANNEL
DATE: 6/27/2007
EC PROJECT # 6028

P:\active\6028 Mountain Creek Flood Protection\CADD-6028\dwg\exh_cross_section\6028exh_25yr_RS3597.dwg, 11x17 (Exhibit) Misc (2), 6/28/2007 1:35:32 PM, bking, 1:1





SECTION A-A (25 YEAR TYPICAL 50' BW EARTHEN CHANNEL)

SCALE 1"=30' H, 1"=3' V

Espey Consultants, Inc.

Environmental & Engineering Services

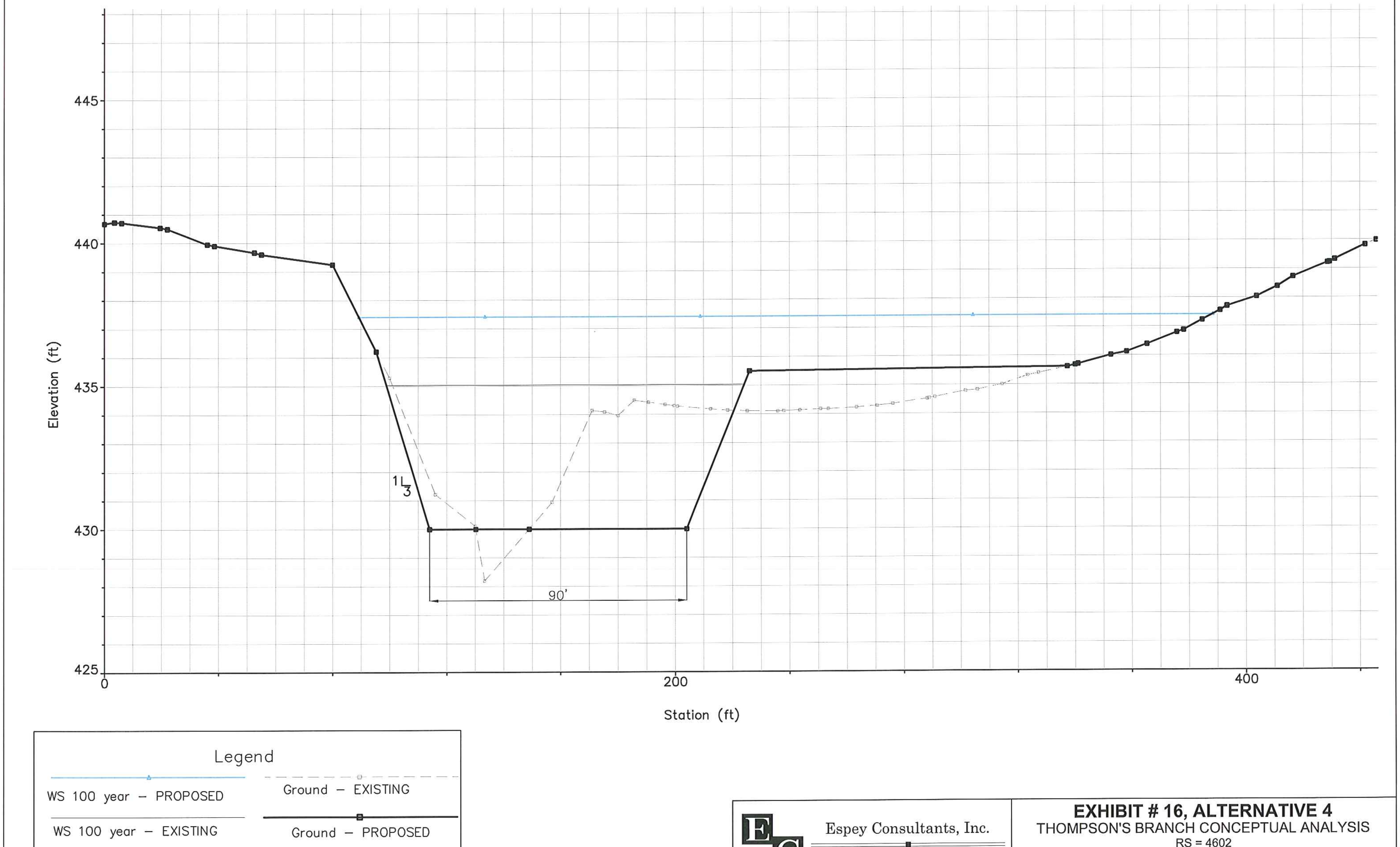
EXHIBIT 15, ALTERNATIVE 3

THOMPSON'S BRANCH CONCEPTUAL ANALYSIS

PROPOSED 50' BOTTOM WIDTH EARTHEN CHANNEL

JUNE 2007

EC PROJECT 6028.101



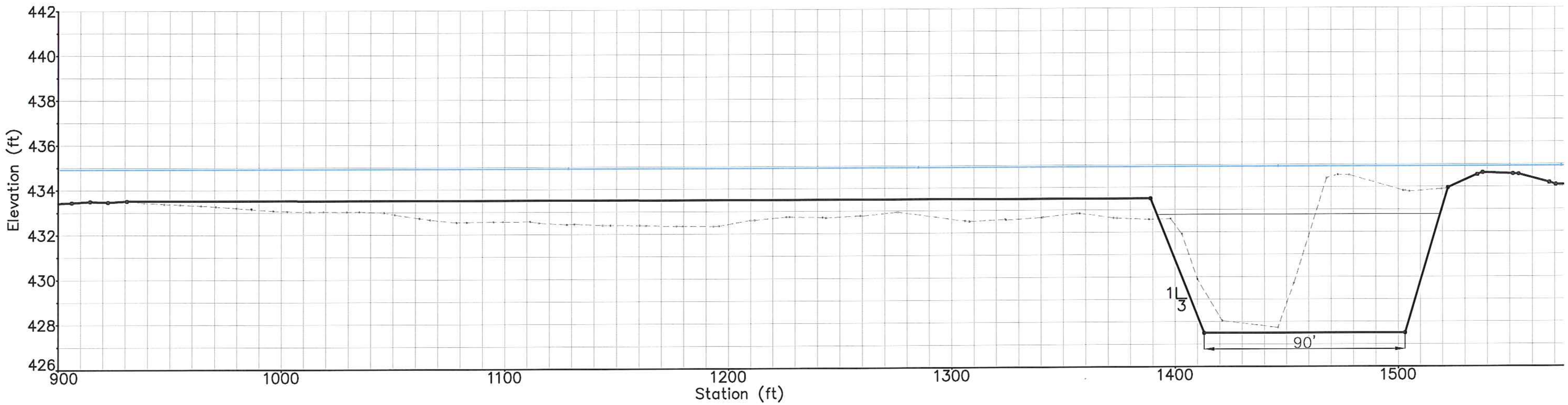
SCALE: 1" = 30'

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT # 16, ALTERNATIVE 4
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS
RS = 4602
PROPOSED 90 FT. BOTTOM CHANNEL

DATE: 5/22/2007
EC PROJECT # 6028

P:\active\6028 Mountain Creek Flood Protection\CADD-6028\dwg\exh_cross_section\6028exh_90BW_RS4602.dwg, 11x17 (Exhibit) Misc, 6/27/2007 3:39:53 PM, bking, 1:1



Legend

WS 100 year – EXISTING	Ground – EXISTING
WS 100 year – PROPOSED	Ground – PROPOSED

SCALE: 1" = 45'

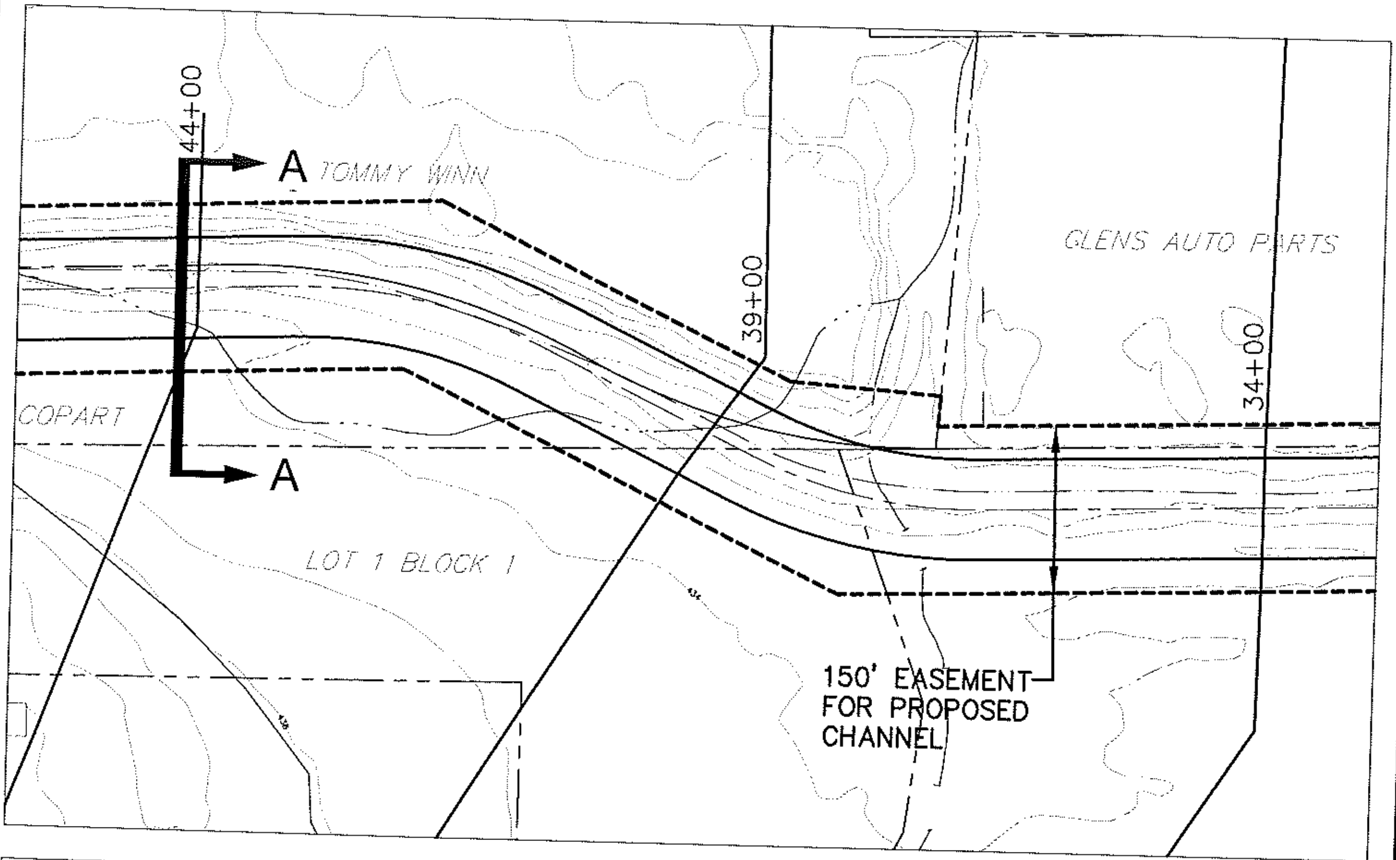
Espey Consultants, Inc.
Environmental & Engineering Services

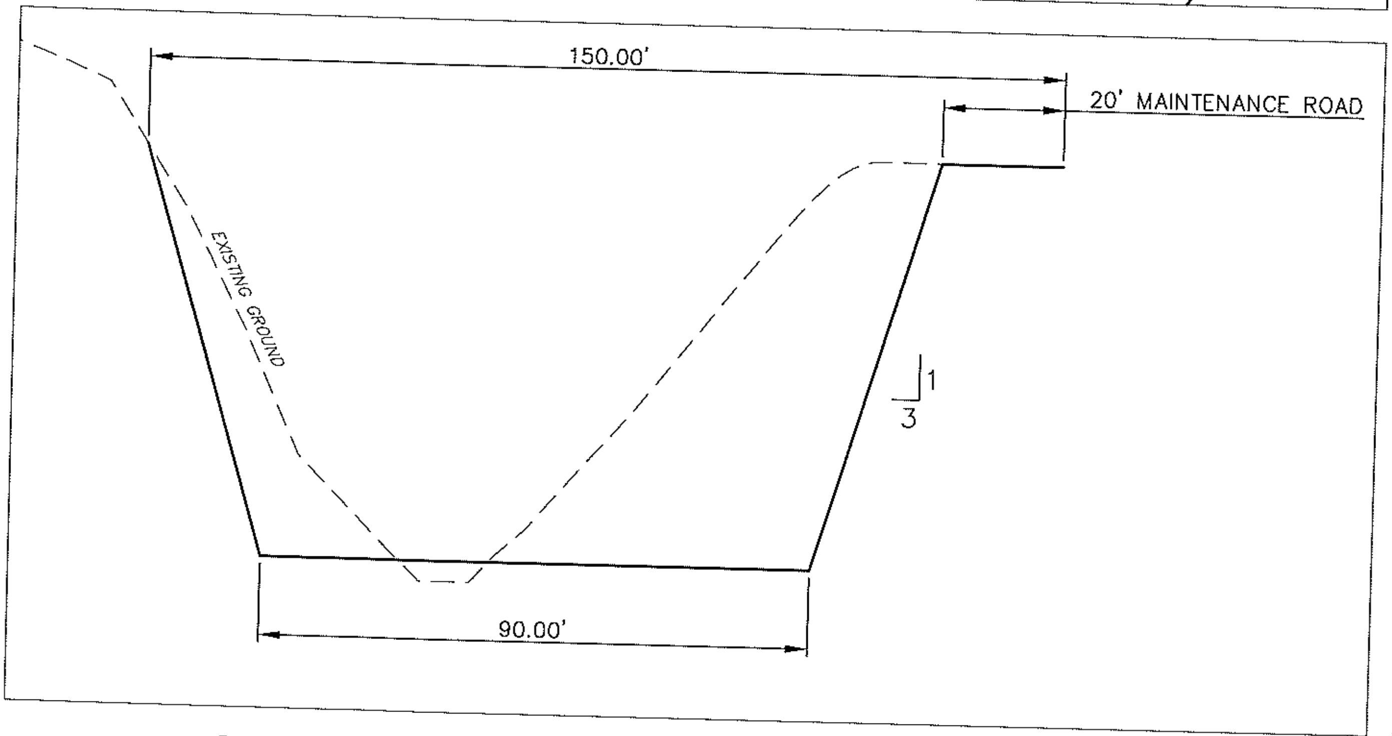
EXHIBIT # 17, ALTERNATIVE 4
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS
RS = 3597
PROPOSED 90 FT. BOTTOM CHANNEL

DATE: 5/22/2007

EC PROJECT # 6028

P:\active\6028 Mountain Creek Flood Protection\CADD-6028\dwg\exh_cross_section\6028exh_90BW_RS3597.dwg, 11x17 (Exhibit) Misc, 6/27/2007 3:39:18 PM, bking, 1:1



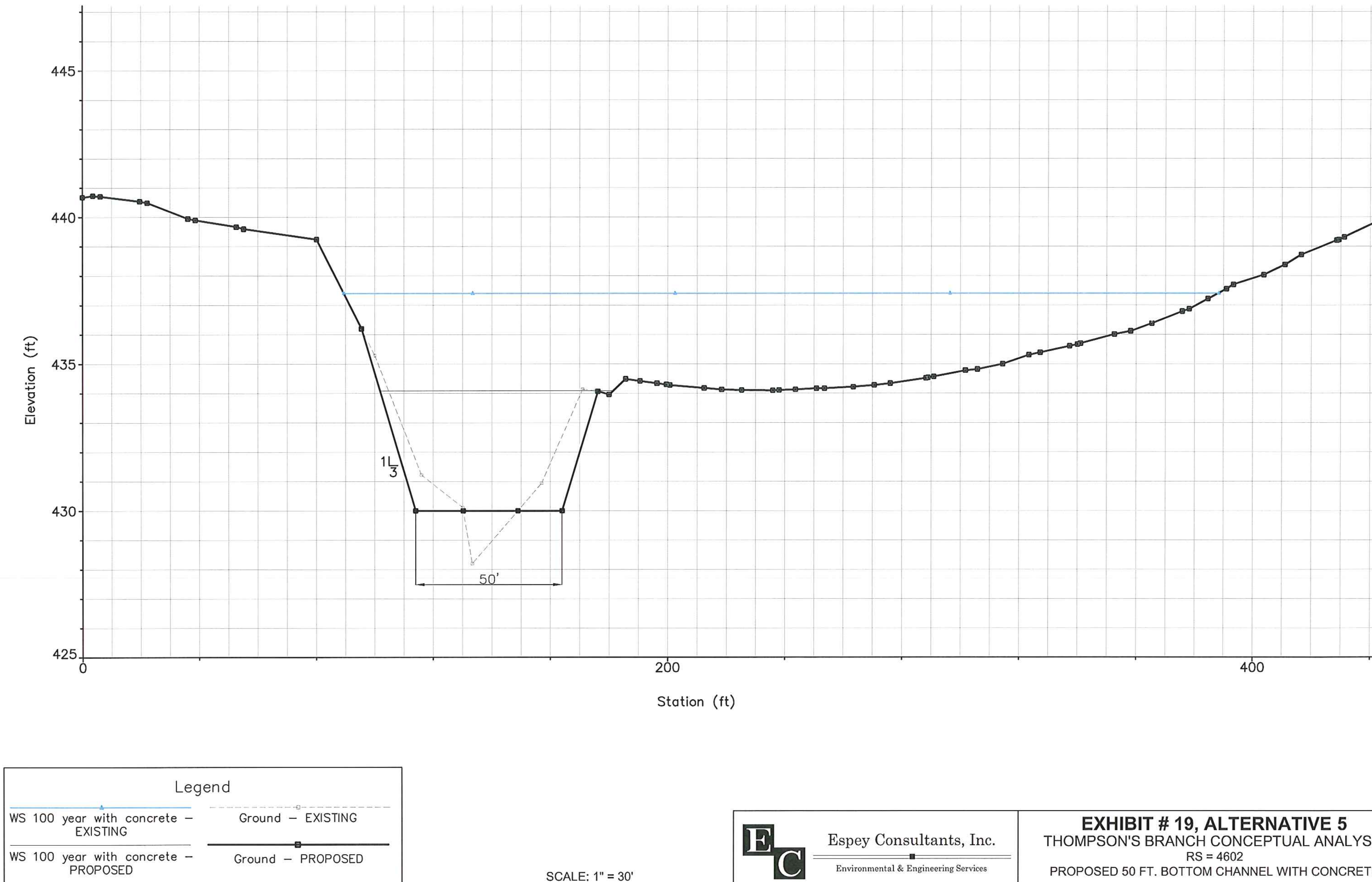


SECTION A-A (100 YEAR TYPICAL 90' BW CHANNEL)

SCALE 1"=30' H, 1"=3' V

Espey Consultants, Inc. Environmental & Engineering Services	**EXHIBIT 18, ALTERNATIVE 4** THOMPSON'S BRANCH CONCEPTUAL ANALYSIS PROPOSED 90' BOTTOM WIDTH CHANNEL
	MAY 2007 EC PROJECT 6028.101

P:\active\6028 Mountain Creek Flood Protection\CADD-6028\dwg\exh_cross_section\6028exh_TYP_XSECTIONS.dwg, 90 FTBW CHANNEL, 6/27/2007 3:45:32 PM, bking, 1:1



SCALE: 1" = 30'

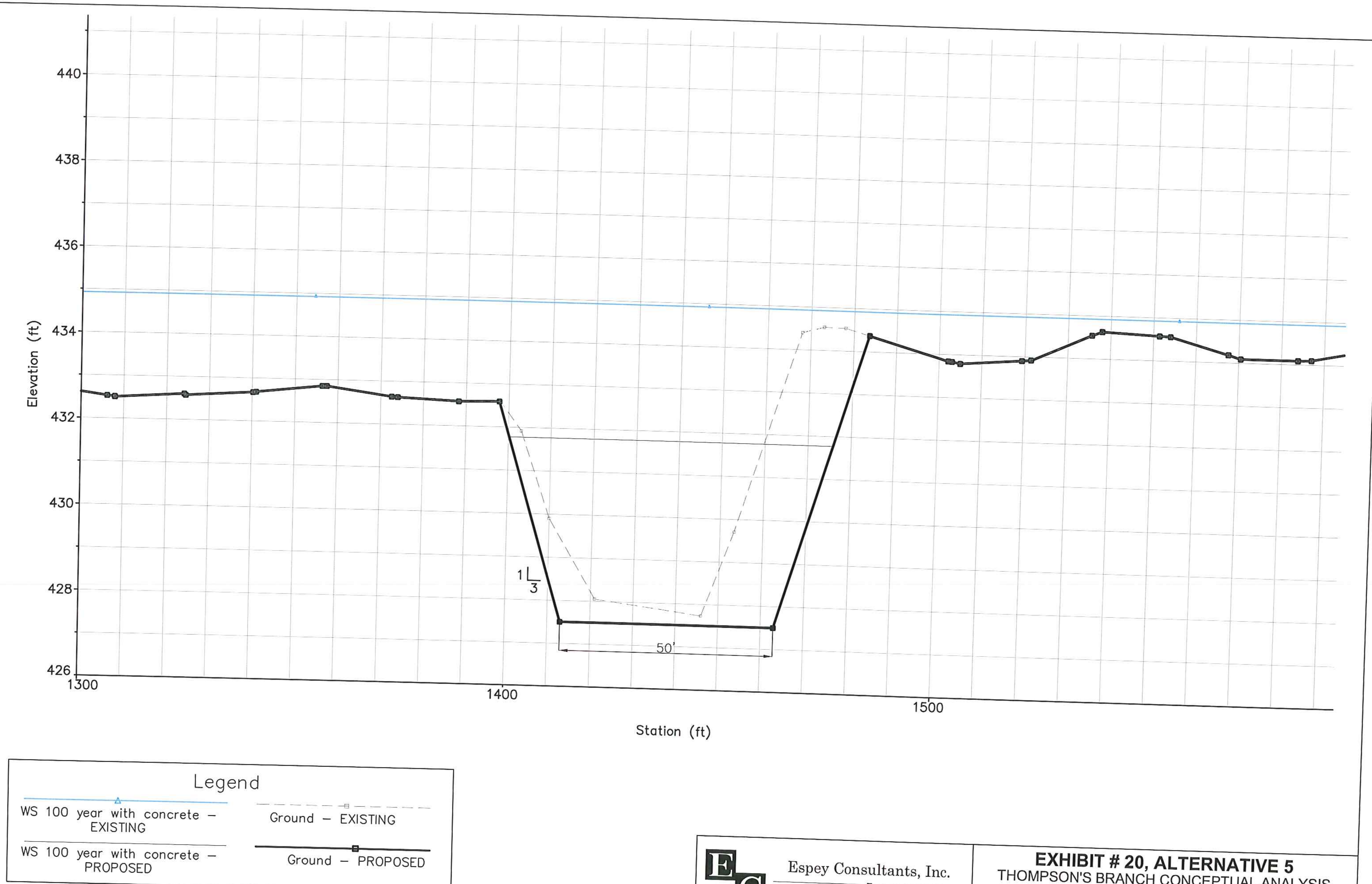
Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT # 19, ALTERNATIVE 5
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS
RS = 4602
PROPOSED 50 FT. BOTTOM CHANNEL WITH CONCRETE

DATE: 5/22/2007

EC PROJECT # 6028

P:\active\6028 Mountain Creek Flood Protection\CADD-6028\dwg\exh_cross_section\6028exh_100yr_RS4602.dwg, 11x17 (Exhibit) Misc, 6/27/2007 3:43:45 PM, bking, 1:1

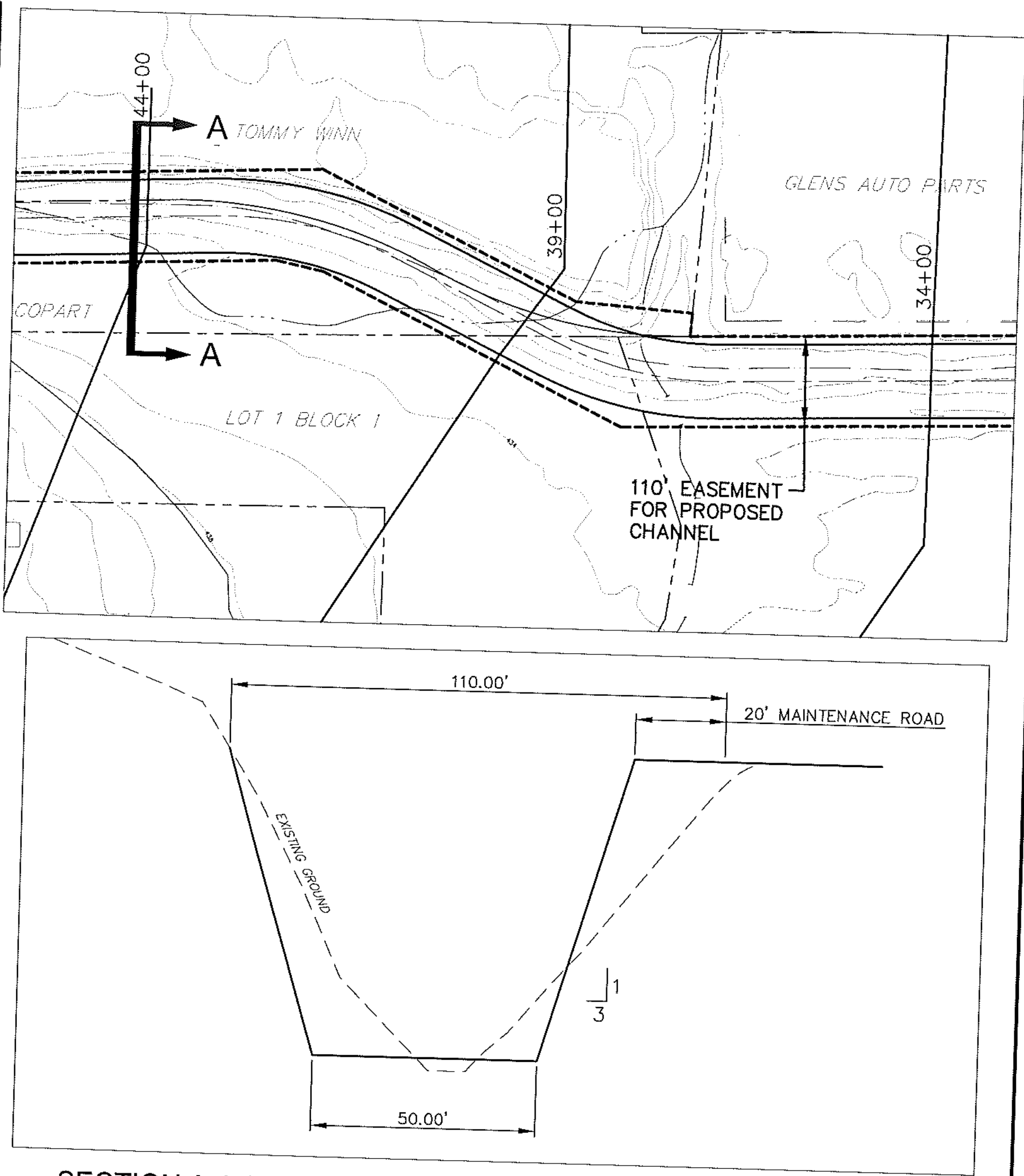


SCALE: 1" = 20'

Espey Consultants, Inc.
Environmental & Engineering Services

EXHIBIT # 20, ALTERNATIVE 5
THOMPSON'S BRANCH CONCEPTUAL ANALYSIS
RS = 3597
PROPOSED 50 FT. BOTTOM CHANNEL WITH CONCRETE
DATE: 5/22/2007
EC PROJECT # 6028

P:\active\6028 Mountain Creek Flood Protection\CADD-6028\dwg\exh_cross_section\6028exh_100yr_RS3597.dwg, 11x17 (Exhibit) Misc, 6/27/2007 3:43:15 PM, bking, 1:1



SECTION A-A (100 YEAR TYPICAL 50' BW CONCRETE CHANNEL)

SCALE 1"=30' H, 1"=3' V

Espey Consultants, Inc.

Environmental & Engineering Services

EXHIBIT 21, ALTERNATIVE 5

THOMPSON'S BRANCH CONCEPTUAL ANALYSIS

PROPOSED 50' BOTTOM WIDTH CONCRETE CHANNEL

MAY 2007

EC PROJECT 6028.101

P:\active\6028 Mountain Creek Flood Protection\CADD-6028\dwg\exh_cross_section\6028exh_TYP_XSECTIONS.dwg, 50 FT BW CHANNEL WITH CONCRETE, 6/27/2007 3:46:24 PM, bking, 1:1

APPENDIX B
PROBABLE CONSTRUCTION COST ESTIMATE

Probable Construction Cost Estimate Analysis
Alternative 1 Cost Estimate
Alternative 2 Cost Estimate
Alternative 3 Cost Estimate
Alternative 4 Cost Estimate
Alternative 5 Cost Estimate

Probable Construction Cost Estimate Analysis:

Unit costs used to estimate costs for the proposed alternatives are based on cost estimate provided by local contractor, Mario Sinacola and Sons Excavating, Inc.

Construction costs, contingency, and engineering costs are all estimated for the total cost for each project. Land costs for easements and right-of-way are not included, and could be a significant cost. Special services such as environmental permitting, land agent costs and geotechnical investigations are not included in the costs. The necessity for these services, and the required scope of work, are typically not known before more detailed study of the project is performed at the preliminary engineering design phase.

Project: Thompsons Branch Conceptual Analysis
EC Job 6028
By Espey Consultants
Date 30-Jul-07

Title **Alternative 1**: Cleaning the Existing Channel

Item No.	Quantity	Unit	Item Description	Probable Cost ESTIMATE Unit Price	Amount
1	1	LS	Removal of vegetation		$ 75,000.00
2	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 3,750.00
3	1	LS	Nationwide 404 Permit, if required.		$ 20,000.00
4	4.92	Acre	Easement Required excluding the existing easement.	$ 21,000.00	$ 103,320.00
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		**$ 202,070.00**
			Contingency (15%)		$ 30,310.50
			Subtotal		**$ 232,380.50**
			TOTAL ESTIMATED COST		**$ 233,000**

NOTE: The improvements noted in this Alternative reference protection for local Thompson's Branch flood events **only** and are **not** intended to mitigate for flood flows or inundation resulting from Mountain Creek flood events.

Project: Thompsons Branch Conceptual Analysis
EC Job 6028
By Espey Consultants
Date 30-Jul-07

Title **Alternative 2**: 50 ft BW Channel for 10 yr Event

Item No.	Quantity	Unit	Item Description	Unit Price (Probable Construction Cost ESTIMATE)	Amount (Probable Construction Cost ESTIMATE)
1	28,500	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.	$ 12.00	$ 342,000.00
2	5,600	CY	**Compacted Fill and Channel Fill** complete including placing, compacting, and grading soil.	$ 2.00	$ 11,200.00
3	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 17,660.00
4	10,000	LF	**Silt Fence Erosoion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and	$ 2.00	$ 20,000.00
5	1	LS	Cleaning Natural Vegetation in the channel		$ 75,000.00
6	1	LS	Nationwide 404 Permit		$ 40,000.00
7	11.31	Acre	Easement Required excluding the existing easement.	$ 21,000.00	$ 237,510.00
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		**$ 743,370.00**
			Contingency **(15%)**		$ 111,505.50
			Subtotal		**$ 854,875.50**
8			Engineering and surveying **(20%)**		$ 170,975
			TOTAL ESTIMATED COST		**$ 1,030,000**

NOTE: The improvements noted in this Alternative reference protection for local Thompson's Branch flood events **only** and are **not** intended to mitigate for flood flows or inundation resulting from Mountain Creek flood events.

Project: Thompsons Branch Conceptual Analysis
EC Job 6028
By Espey Consultants
Date 30-Jul-07

Title **Alternative 3:** 50 BW Channel for 25 yr Event

Item No.	Quantity	Unit	Item Description	Probable Construction Cost ESTIMATE Unit Price	Amount
1	28,600	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.	$ 9.00	$ 257,400.00
2	23,500	CY	**Compacted Fill and Channel Fill** complete including placing, compacting, and grading soil.	$ 2.00	$ 47,000.00
3	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 15,220.00
4	10,000	LF	**Silt Fence Erosoion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and	$ 2.00	$ 20,000.00
5	1	LS	Cleaning Natural Vegetation in the channel		$ 75,000.00
6	1	LS	Nationwide 404 Permit		$ 40,000.00
7	11.31	Acre	Easement Required excluding the existing easement.	$ 21,000.00	$ 237,510.00
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		**$ 692,130.00**
			Contingency **(15%)**		$ 103,819.50
			Subtotal		**$ 795,949.50**
8			Engineering and surveying **(20%)**		$ 159,190
			TOTAL ESTIMATED COST		**$ 960,000**

NOTE: The improvements noted in this Alternative reference protection for local Thompson's Branch flood events **only** and are **not** intended to mitigate for flood flows or inundation resulting from Mountain Creek flood events.

Project: Thompsons Branch Conceptual Analysis
EC Job 6028
By Espey Consultants
Date 30-Jul-07

Title **Alternative** 4: 90 ft BW Channel for 100 yr Event

Item No.	Quantity	Unit	Item Description	Probable Construction Cost ESTIMATE Unit Price	Amount
1	75,000	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.	$ 12.00	$ 900,000.00
2	9,900	CY	**Compacted Fill and Channel Fill** complete including placing, compacting, and grading soil.	$ 2.00	$ 19,800.00
3	1	LS	Site Preparation, Mobilization/Demobilization (5%)		$ 45,990.00
4	10,000	LF	**Silt Fence Erosoion Control complete** including material and installation, inspection and sediment removal, Repair and Removal and	$ 2.00	$ 20,000.00
5	1	LS	Cleaning Natural Vegetation in the channel		$ 75,000.00
6	1	LS	Nationwide 404 Permit		$ 40,000.00
7	14.70	Acre	Easement Required excluding the existing easement.	$ 21,000.00	$ 308,700.00
Approximate time frame to obtain Nationwide Permit is 6 to 12 months.					
			Subtotal		**$ 1,409,490.00**
			Contingency **(15%)**		$ 211,423.50
			Subtotal		**$ 1,620,913.50**
8			Engineering and surveying **(20%)**		$ 324,183
			TOTAL ESTIMATED COST		**$ 1,950,000**

NOTE: The improvements noted in this Alternative reference protection for local Thompson's Branch flood events **only** and are **not** intended to mitigate for flood flows or inundation resulting from Mountain Creek flood events.

Project: Thompsons Branch Conceptual Analysis
EC Job 6028
By Espey Consultants
Date 2-Jul-07

Title **Alternative 5**: 50 ft BW Concrete Channel for 100 yr Event

Concerete Volume Estimation	
Bottom Width	50 ft.
Height	5.5 ft.
Slope Lengths	17.4 ft.
Vol of bottom width 50 ft and 4900 ft length channel, 8" conc thick	6100 yd^3
Vol of side slopes with 17.4ft length and 8" conc thick	4300 yd^3

Item No.	Quantity	Unit	Item Description	Probable Construction Cost ESTIMATE: Unit Price	Probable Construction Cost ESTIMATE: Amount
1	28,100	CY	**Unclassified Channel Excavation,** work fully performed as per details and specifications.		
2	700	CY	**Compacted Fill and Channel Fill** complete including placing, compacting, and grading soil.		
				$ 10.00	$ 281,000.00
3	10,400	CY	**Concrete Channel, 8"** concerete at compressive strength of 3000 psi at 28 days.		
4	1	LS	**Site Preparation, Mobilization/Demobilization** (5%)	$ 1.50	$ 1,050.00
5	1	LS	**Erosoion Control**	$ 300.00	$ 3,120,000.00
6	1	LS	404 Individual Permit		$ 170,102.50
					$ 75,000.00
7	10.16	Acre	Easement Required excluding the existing easement.		$ 100,000.00
				$ 21,000.00	$ 213,360.00
Approximate time frame to obtain Nationwide Permit is 2 years.					
			Subtotal		$ 3,960,512.50
			Contingency **(15%)**		$ 594,076.88
			Subtotal		**$ 4,554,589.38**
8			Engineering and surveying **(20%)**		$ 910,918
			TOTAL ESTIMATED COST		**$ 5,470,000**

NOTE: The improvements noted in this Alternative reference protection for local Thompson's Branch flood events **only** and are **not** intended to mitigate for flood flows or inundation resulting from Mountain Creek flood events.

APPENDIX C
HYDRAULIC REPORTS

HEC-RAS Report for Existing Model
HEC-RAS Report for 1997 Design Channel
HEC-RAS Report for Alternative 1
HEC-RAS Report for Alternative 2
HEC-RAS Report for Alternative 3
HEC-RAS Report for Alternative 4
HEC-RAS Report for Alternative 5

HEC-RAS Report for Existing Model

HEC-RAS Version 3.1.1 May 2003
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X     X  XXXXXX   XXXX        XXXX     XX    XXXX
X     X  X       X    X       X   X   X  X   X
X     X  X       X            X   X  X    X  X
XXXXXXX  XXXX    X       XXX  XXXX   XXXXXX  XXXX
X     X  X       X            X X    X    X      X
X     X  X       X    X       X  X   X    X      X
X     X  XXXXXX   XXXX        X   X  X    X  XXXXX
```

PROJECT DATA
Project Title: Prelim. Analysis Thompson's Branch
Project File : TBrPrelim.prj
Run Date and Time: 5/21/2007 6:03:25 PM

Project in English units

PLAN DATA

Plan Title: GeoRAS Extended (Existing Conditions)
Plan File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.p05

Geometry Title: GeoRAS EXTENDED Geometry
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g07

Flow Title : Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Plan Summary Information:

Number of:	Cross Sections =	10	Mulitple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Flow Data (cfs)

River	Reach	RS	100 year	25 year	10 year	5 year	2 year
Thompsons	Thompsons	4901	2740	2170	1820	1510	1050
Thompsons	Thompsons	4602	2680	2190	1850	1530	1060
Thompsons	Thompsons	3597	2870	2290	1910	1580	1100
Thompsons	Thompsons	2597	3060	2400	1980	1630	1110
Thompsons	Thompsons	1600	3300	2510	2060	1690	1120
Thompsons	Thompsons	738	3420	2620	2150	1730	1130

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Thompsons	Thompsons	100 year		Normal S = 0.0025
Thompsons	Thompsons	25 year		Normal S = 0.0025
Thompsons	Thompsons	10 year		Normal S = 0.0025
Thompsons	Thompsons	5 year		Normal S = 0.0025
Thompsons	Thompsons	2 year		Normal S = 0.0025

GEOMETRY DATA

Geometry Title: GeoRAS EXTENDED Geometry
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g07

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4901

INPUT
Description:
Station Elevation Data num= 104

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	444.78	3.03	444.68	9.59	444.46	19.83	444.26	26.09	444.15
36.62	443.85	42.59	443.67	53.08	443.35	58.6	443.11	69.7	442.75
75.1	442.6	86.49	442.32	91.6	442.19	103.28	442.02	108.1	441.95
120.08	441.91	124.61	441.89	136.49	441.83	140.61	441.83	153.15	441.66
157.11	441.63	169.95	441.44	173.61	441.36	186.74	441.06	190.12	440.95
203.53	440.64	206.62	440.56	219.9	440.46	222.62	440.35	236.61	439.89
239.12	439.85	253.4	439.82	255.63	439.82	270.2	439.82	272.13	439.78
286.99	439.65	288.63	439.59	303.32	439.27	304.63	439.28	320.07	439.2
321.14	439.19	336.86	439.08	337.64	439.08	353.65	439.15	354.14	439.15
355.48	439.15	365	441.21	385	437.29	401	433.21	415	432.11
418.3	430.2	421.3	429.25	442	432.94	456	436.14	460.3	436.09
465	435.96	472.3	435.73	484.31	435.9	485.14	435.91	500.82	436.04
501.64	436.04	517.34	435.99	518.14	435.99	533.85	436.03	534.64	436.04
549.88	436.11	550.64	436.11	566.37	436.19	567.14	436.2	582.89	436.47
583.64	436.47	599.4	436.77	600.14	436.79	615.91	437.14	616.64	437.16
631.94	438.2	632.64	438.23	648.43	438.84	649.14	438.86	664.95	439.36
665.64	439.39	681.46	440.15	682.14	440.18	697.97	440.73	698.64	440.76
714	441.22	714.64	441.24	730.5	441.78	731.14	441.8	747.01	442.15
747.64	442.18	763.52	442.79	764.14	442.82	780.03	443.48	780.64	443.5
796.06	444.64	796.64	444.66	812.56	446.19	813.14	446.23	829.07	446.25
829.64	446.26	845.58	446.52	846.14	446.54	849.41	446.64		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	385	.06	456	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
385	456	300	299	290	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4602

INPUT
Description:
Station Elevation Data num= 113

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	440.68	3.59	440.73	6.09	440.71	19.59	440.54	22.14	440.49
36.09	439.95	38.61	439.9	52.59	439.67	55.08	439.6	80	439.24
100	435.29	116	431.22	130	430.11	133.3	428.2	157	430.94
171	434.14	175.3	434.09	180	433.96	185.67	434.49	190.58	434.42
196.4	434.34	199.56	434.3	200.73	434.28	212.38	434.18	218.34	434.13
225.21	434.11	235.95	434.1	238.04	434.11	243.63	434.13	250.86	434.17
253.56	434.17	263.47	434.22	270.64	434.28	276.13	434.34	288.25	434.52
288.96	434.54	290.86	434.57	301.74	434.78	305.86	434.82	314.51	435
323.47	435.31	327.29	435.39	337.37	435.61	340.07	435.67	341.08	435.7
352.64	436.01	358.15	436.12	365.34	436.38	375.76	436.79	378.16	436.87
384.6	437.22	390.96	437.55	393.37	437.7	403.74	438.03	410.98	438.38
416.51	438.72	428.59	439.21	429.27	439.23	431.12	439.32	441.8	439.82
445.67	439.98	454.54	440.38	463.28	440.7	467.37	440.84	478.35	441.1
480.2	441.14	480.89	441.16	493.02	441.54	498.5	441.61	505.85	441.8
516.11	442.07	518.62	442.17	525.58	442.45	531.14	442.67	533.18	442.76
543.87	443.07	550.79	443.4	556.64	443.52	568.4	443.96	569.41	443.99
572.09	444.09	582.23	444.39	586.01	444.46	595.06	444.33	603.62	444.34
607.79	444.36	619.32	444.49	620.33	444.5	620.7	444.5	633.09	444.76
638.31	444.86	645.87	445.17	655.91	445.47	658.64	445.49	665.84	445.6
671.44	445.67	673.52	445.69	684.26	445.77	691.13	445.9	696.96	445.89
708.21	446.01	709.53	446.03	713.07	446.06	722.36	446.11	725.82	446.13
735.18	446.25	743.43	446.36	748.01	446.38	760.3	446.68	760.84	446.69
761.04	446.7	773.61	446.85	776.69	446.87				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	100	.06	171	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
100	171	517	498	440	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4104

INPUT
Description:
Station Elevation Data num= 292

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.12	6.1	435.47	11.47	434.9	22.73	433.25	27.97	432.44
39.37	431.58	44.47	431.22	55.65	431.57	60.47	431.69	72.13	431.84
76.98	431.93	88.77	431.49	93.48	431.32	105.4	430.85	109.98	430.64
122.04	430.44	126.48	430.41	138.3	430.82	142.48	430.94	154.81	431.24
158.98	431.34	171.44	431.49	175.48	431.61	200.88	431.42	208.48	431.23
220.95	431.04	224.48	431.03	237.48	431.05	240.98	431.05	254.11	431.21
257.48	431.27	270.75	431.72	273.98	431.74	287.38	432.73	290.48	432.82
303.6	431.55	306.48	431.45	320.15	432.1	322.98	432.18	336.78	432.15
339.48	432.18	353.42	431.89	355.98	431.88	370.05	431.79	372.48	431.78
386.25	431.95	388.48	431.95	402.82	432.01	404.99	432.02	419.45	432.09
421.49	432.12	436.09	432.1	437.99	432.07	452.72	432.19	454.49	432.21
468.9	432.22	470.49	432.24	485.49	432.2	486.99	432.19	502.12	431.97
503.49	431.96	518.76	431.97	519.99	431.96	535.39	431.94	536.49	431.94
551.55	431.93	552.49	431.93	568.16	432.07	568.99	432.08	584.79	432.42
585.49	432.43	601.43	432.73	601.99	432.75	618.06	432.93	618.49	432.94
634.2	433.16	634.49	433.17	650.83	433.59	650.99	433.59	667.46	434.16
667.49	434.16	671.36	434.2	683.99	434.31	684.1	434.31	700.49	434.37
700.72	434.37	716.5	434.17	716.86	434.16	733	434.09	733.49	434.09
749.5	434.03	750.12	434.04	766	434.14	766.76	434.13	782.5	433.84
783.36	433.83	798.5	433.75	799.52	433.75	815	433.8	816.15	433.81
831.5	433.96	832.78	433.94	848	433.99	856.81	433.95	946.5	433.14
948.64	433.11	962.5	432.99	964.84	432.99	979	433.02	981.47	433.01
995.5	433	998.1	433.03	1005.03	433.11	1052.01	433.71	1057.95	433.79
1061.01	433.86	1064.13	433.84	1077.51	433.8	1080.76	433.77	1094.01	433.77
1107.04	436.09	1113.92	436.88	1126.51	437.36	1130.16	437.55	1143.01	438.42
1146.79	438.58	1159.51	439.34	1163.42	439.31	1176.01	439.06	1180.06	439.09
1192.51	439.05	1196.56	439.19	1208.51	439.67	1212.82	439.85	1225.01	440.01
1229.45	440.13	1241.51	440.09	1253.38	439.93	1258.01	439.68	1272.1	439.69
1279.2	439.64	1290.51	439.66	1295.48	439.51	1307.01	439.11	1313	438.94
1347.58	432.54	1363	429.68	1381	428.86	1408	429.52	1419	431.98
1431	432.73	1432.19	432.35	1441.17	432.81	1442.17	432.82	1447.4	432.9
1453.13	433.02	1462.22	433.19	1465.07	433.25	1466.9	433.27	1476.78	433.35
1485.81	433.43	1488.5	433.47	1492.72	433.52	1500.44	433.63	1505.31	433.67
1512.41	433.75	1523.68	433.91	1524.37	433.92	1524.81	433.92	1536.34	434.08
1544.3	434.1	1548.3	434.11	1554.65	434.19	1560.23	434.27	1563.8	434.33
1571.97	434.45	1582.71	434.57	1583.66	434.57	1585.15	434.59	1595.62	434.7
1602.21	434.76	1607.58	434.8	1616.12	434.89	1619.53	434.92	1621.71	434.95
1631.42	435.06	1641.2	435.13	1643.31	435.14	1646.62	435.17	1655.26	435.25
1660.7	435.31	1667.1	435.39	1677.58	435.52	1678.84	435.53	1679.61	435.54
1690.79	435.62	1699.11	435.69	1702.76	435.72	1708.55	435.79	1714.68	435.88
1718.61	435.91	1726.58	435.99	1738.1	436.07	1738.47	436.07	1739.05	436.07
1750.43	436.18	1757.6	436.23	1762.31	436.25	1770.02	436.29	1774.02	436.31
1776.51	436.33	1785.87	436.34	1796.01	436.28	1797.77	436.3	1800.52	436.31
1809.71	436.39	1815.51	436.42	1821.68	436.52	1831.48	436.73	1833.64	436.78
1835	436.8	1845.61	436.96	1854.5	437.08	1857.52	437.13	1862.45	437.2
1869.22	437.28	1873.41	437.37	1881.03	437.5	1892.91	437.6	1892.92	437.6
1892.95	437.6	1904.89	437.81	1912.41	437.9	1916.85	437.95	1923.92	438.04
1928.79	438.1	1931.9	438.17	1940.68	438.35	1951.4	438.4	1952.56	438.42
1954.42	438.44	1964.28	438.57	1970.31	438.61	1976.13	438.66	1985.38	438.75
1988.1	438.78	1989.81	438.81	2000.06	438.94	2009.31	439.06	2012.03	439.09
2016.35	439.11	2023.95	439.16	2028.8	439.21	2035.84	439.34	2046.85	439.53
2047.74	439.54	2048.3	439.55	2059.49	439.81	2067.21	439.95	2071.31	439.98
2077.82	440.09	2083.24	440.19	2086.71	440.25	2095.13	440.39	2106.21	440.59
2107.03	440.61	2108.32	440.67	2118.99	441.06	2125.7	441.4	2130.95	441.5
2139.28	441.65	2142.92	441.72	2145.2	441.76	2154.7	441.89	2164.11	442.07
2166.48	442.13	2170.25	442.26	2178.4	442.54	2183.61	442.79	2190.29	443.04
2200.75	443.27	2202.19	443.31	2203.1	443.38	2214.16	444.45	2222.6	445.58
2226.12	445.89	2231.72	446.62	2238.05	447.2	2242.1	447.27	2249.8	447.34
2261.01	447.46	2261.42	447.47						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1313	.06	1419	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1313	1419	650	507	490	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1229.45	440.13	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3597

INPUT

Description:

Station Elevation Data num= 410

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.05	6.13	435.53	12.12	435.04	22.3	432.82	28.63	431.64
38.46	430.65	45.13	429.97	54.63	430.56	61.63	430.86	70.52	431.18
77.64	431.32	86.46	431.25	94.14	431.17	102.63	431.06	110.64	430.97
118.79	431.07	127.15	431.14	134.96	431.24	143.65	431.34	150.9	431.36
159.66	431.37	166.8	431.34	176.16	431.43	182.96	431.43	192.66	431.47
199.13	431.76	209.17	432.03	215.29	432.18	225.67	432.49	231.28	432.62
241.67	432.65	247.13	432.52	258.18	432.53	263.29	432.5	274.68	432.27
279.46	432.21	291.18	432.11	295.62	432.11	307.69	432.07	311.67	432.01
323.69	431.79	327.46	431.74	340.19	431.55	343.63	431.52	356.7	431.34
359.79	431.34	373.2	431.28	375.96	431.27	389.7	431.4	392.05	431.39
405.71	431.35	407.79	431.34	422.21	431.27	423.96	431.24	438.71	431.08
440.12	431.08	455.22	430.89	456.29	430.89	471.72	430.67	472.43	430.67
487.73	430.67	488.13	430.67	504.23	430.52	504.29	430.52	507.26	430.52
520.46	430.51	520.73	430.51	536.63	430.5	537.24	430.5	552.8	430.54
553.74	430.53	568.52	430.43	569.74	430.43	584.65	430.51	586.25	430.52
600.82	430.48	602.75	430.48	616.99	430.53	619.25	430.53	633.16	430.51
635.76	430.51	648.92	430.58	651.76	430.57	665	430.65	668.26	430.66
681.17	430.76	684.77	430.8	697.34	430.91	701.27	430.96	713.51	431.1
717.77	431.17	729.33	431.29	733.78	431.35	745.36	431.41	750.28	431.42
761.53	431.45	766.78	431.46	777.7	431.58	783.29	431.6	793.87	431.7
799.79	431.79	809.73	431.92	815.8	431.96	825.72	432.1	832.3	432.23
841.89	432.37	848.8	432.46	858.06	432.58	865.31	432.68	874.23	432.88
881.81	433.07	890.14	433.34	897.81	433.42	906.08	433.45	914.32	433.5
922.25	433.47	930.82	433.52	938.42	433.44	947.32	433.39	954.58	433.36
963.83	433.31	970.55	433.27	979.83	433.2	986.43	433.15	996.33	433.08
1002.6	433.05	1012.84	433.02	1018.77	433.03	1029.34	433.02	1034.94	433.03
1045.84	432.99	1050.96	432.89	1061.85	432.73	1066.79	432.66	1078.35	432.54
1082.96	432.55	1094.85	432.56	1099.13	432.56	1111.36	432.58	1115.3	432.51
1127.86	432.44	1131.36	432.46	1143.87	432.4	1147.15	432.4	1160.37	432.39
1163.32	432.38	1176.87	432.35	1179.49	432.35	1193.38	432.34	1195.66	432.35
1209.88	432.6	1211.77	432.61	1225.88	432.74	1227.51	432.74	1242.39	432.72
1243.68	432.7	1258.89	432.78	1259.84	432.77	1275.39	432.94	1276.01	432.94
1306.07	432.53	1307.86	432.51	1307.9	432.5	1324.03	432.6	1324.4	432.57
1340.2	432.67	1340.91	432.68	1356.37	432.85	1357.41	432.85	1372.54	432.64
1373.91	432.63	1388.27	432.57	1398	432.59	1403	431.92	1410	429.9
1421	428.05	1446	427.73	1453.3	429.71	1468	434.4	1473	434.54
1478	434.53	1502.16	433.84	1503.02	433.83	1504.92	433.79	1519.28	433.9
1521.42	433.92	1535.54	434.54	1537.92	434.63	1551.38	434.57	1553.93	434.56
1567.56	434.18	1570.43	434.09	1583.82	434.09	1586.93	434.1	1600.07	434.36
1603.43	434.44	1616.33	434.54	1619.93	434.57	1632.21	434.35	1635.94	434.33
1648.35	434.39	1651.86	434.41	1652.55	434.42	1661.2	434.64	1672.3	434.73
1673.12	434.72	1674.35	434.72	1684.96	434.67	1692.05	434.66	1696.8	434.57
1703.92	434.42	1708.67	434.31	1711.8	434.25	1720.42	434.25	1730.96	434.29
1732.14	434.31	1733.93	434.32	1743.99	434.39	1750.71	434.53	1755.83	434.63
1763.5	434.73	1767.7	434.8	1770.46	434.85	1779.61	434.84	1790.21	434.78
1791.52	434.77	1793.51	434.76	1803.44	434.71	1809.96	434.67	1815.25	434.76
1823.53	434.87	1826.92	434.92	1829.12	434.93	1838.72	435.02	1848.87	435.12
1850.56	435.1	1853.09	435.07	1862.46	434.95	1868.62	434.9	1874.37	434.83
1883.11	434.71	1886.26	434.67	1888.37	434.65	1898.11	434.61	1908.12	434.55
1909.91	434.55	1912.68	434.57	1921.59	434.61	1927.28	434.65	1933.39	434.72
1942.69	434.81	1945.31	434.83	1947.03	434.85	1957.22	434.88	1966.78	434.9
1969.13	434.91	1972.71	434.9	1981	434.89	1986.53	434.89	1992.84	434.88
2002.27	434.87	2004.69	434.86	2006.28	434.86	2016.41	434.89	2025.44	434.86
2028.16	434.85	2032.29	434.83	2040.02	434.78	2045.19	434.75	2051.86	434.71
2061.85	434.68	2063.71	434.68	2064.94	434.67	2075.63	434.65	2084.69	434.62
2087.54	434.62	2091.87	434.6	2099.45	434.58	2104.44	434.53	2111.24	434.54
2121.89	434.52	2122.92	434.52	2123.59	434.51	2134.75	434.5	2143.35	434.43
2146.59	434.42	2151.45	434.47	2158.48	434.55	2163.1	434.55	2170.39	434.55
2181.47	434.64	2182.3	434.65	2182.85	434.65	2194.14	435.03	2202.6	434.89
2205.91	434.74	2211.03	434.85	2217.58	434.83	2221.75	434.88	2229.41	434.66
2241.05	434.54	2241.32	434.53	2241.5	434.52	2253.24	433.77	2261.26	432.99
2265.15	432.78	2271.07	432.43	2277.03	432.11	2281.01	431.99	2288.87	431.79
2300.63	431.53	2300.71	431.53	2300.76	431.53	2312.4	431.59	2319.91	431.32
2324.17	431.36	2330.65	431.32	2336.05	431.71	2339.66	431.85	2347.89	432.05
2359.42	432.97	2359.73	432.99	2360.21	433.02	2371.64	433.41	2379.17	433.94
2383.56	434.05	2390.23	434.18	2395.47	434.01	2398.92	434.12	2407.23	434.33
2418.07	434.78	2418.93	434.83	2420.25	434.88	2430.78	434.97	2437.82	435.14
2442.62	435.22	2449.81	435.43	2454.49	435.52	2457.57	435.63	2466.41	435.74
2477.33	435.98	2478.32	435.95	2479.83	435.9	2490.17	435.42	2497.08	435.28
2501.92	435.27	2509.39	435.21	2513.57	435.16	2516.23	435.14	2525.43	435.16
2535.98	435.19	2537.34	435.18	2539.41	435.18	2549.26	435.19	2555.73	435.17
2561.17	435.19	2569.43	435.15	2573.06	435.15	2575.49	435.15	2584.9	435.37
2595.24	435.58	2596.71	435.6	2598.99	435.66	2608.39	435.93	2614.39	435.97
2620.19	435.98	2629.01	436.09	2632.09	436.13	2634.14	436.16	2643.93	436.19
2653.89	436.19	2655.77	436.2	2658.57	436.21	2667.66	436.21	2673.65	436.27
2679.57	436.36	2688.59	436.46	2691.49	436.49	2693.4	436.54	2703.21	436.89
2712.55	437.03	2714.95	437.11	2718.6	437.24	2726.81	437.6	2732.3	437.71
2738.66	437.86	2748.17	438.29	2750.51	438.4	2752.05	438.44	2762.42	438.55
2771.8	438.75	2774.34	438.78	2778.18	438.84	2786.2	438.89	2791.56	438.95
2797.92	439.02	2807.75	439.11	2809.56	439.14	2810.71	439.17	2821.45	439.34
2830.46	439.6	2833.36	439.69	2837.77	439.74	2845.27	439.85	2850.21	439.93
2857.19	440.1	2867.78	440.27	2869.09	440.3	2869.96	440.32	2875.28	440.48

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0	.1	1398	.06	1473	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1398	1473	510	499	584	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1770	2438	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3098

INPUT
Description:
Station Elevation Data num= 432

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.2	1.24	436.13	14.84	434.22	17.24	433.89	31.14	431.7
33.74	431.33	47.51	429.83	50.24	429.45	63.89	430.18	66.74	430.35
80.26	430.92	83.24	431.05	96.23	431.18	99.24	431.22	112.51	430.73
115.74	430.64	128.88	430.51	132.24	430.46	145.26	430.79	148.74	430.87
165.24	431.1	177.62	431.14	181.24	431.14	193.88	431.19	197.74	431.2
210.25	431.27	226.63	431.39	230.74	431.43	243	431.49	247.24	431.56
259.01	431.53	263.24	431.51	275.25	431.39	279.74	431.31	291.62	431.34
308	431.42	312.74	431.43	324.37	431.36	329.24	431.34	345.25	431.24
372.99	430.99	378.25	430.92	394.75	431.01	405.74	431.14	411.25	431.23
421.79	431.33	427.25	431.35	437.99	431.34	443.75	431.37	454.36	431.51
460.25	431.56	487.11	431.54	493.25	431.52	503.17	431.64	509.25	431.74
525.75	431.76	542.25	431.89	552.11	431.88	558.75	431.91	568.48	431.99
575.25	432.07	584.56	432.12	591.25	432.17	607.75	432.02	617.1	432.05
624.25	432.03	640.75	432.15	657.25	432.14	665.95	432.11	673.26	432.11
682.1	432.09	689.76	432.05	698.47	432.17	706.26	432.31	714.85	432.39
722.76	432.41	739.26	432.4	755.26	432.36	771.76	432.49	779.84	432.5
788.26	432.49	796.22	432.56	804.76	432.57	812.59	432.65	821.26	432.83
837.26	432.7	844.84	432.66	853.76	432.54	861.21	432.48	870.26	432.53
886.76	432.45	893.96	432.45	903.26	432.4	910.12	432.46	919.26	432.52
926.21	432.55	942.58	432.52	952.26	432.54	958.96	432.53	975.33	432.44
985.26	432.43	991.51	432.46	1001.27	432.47	1007.58	432.52	1017.77	432.56
1023.95	432.56	1040.33	432.63	1050.77	432.76	1056.66	432.94	1059.61	433.39
1072.96	434.33	1080.36	434.32	1102.72	435.18	1109.42	435.54	1137.67	435.54
1143.71	435.47	1238.36	434.69	1261.77	434.41	1334.36	433.31	1336.06	433.21
1339.39	433.02	1345.78	433.39	1355	433	1384	431.97	1395	428.56
1399	425.85	1401.5	425.77	1404.5	426.04	1414	427.71	1427	426.93
1430	426.45	1435	427.29	1452	432.62	1456	433.19	1464.93	433.35
1477.28	433.77	1481.4	433.77	1491.62	433.83	1493.44	433.85	1496.12	433.83
1508.59	433.63	1521.06	433.5	1529.67	433.53	1533.52	433.64	1545.97	433.82
1547.79	433.85	1565.9	434.01	1581.38	433.82	1582.83	433.8	1583.47	433.79
1595.28	433.72	1601.59	433.67	1607.75	433.78	1619.7	433.95	1620.21	433.95
1637.82	434.12	1645.03	434.1	1655.93	434.11	1660.71	434.08	1669.6	434.01
1673.5	433.97	1691.62	434.33	1706.91	434.28	1709.73	434.3	1727.85	433.99
1731.84	434.01	1740.64	433.89	1744.29	433.88	1745.96	433.86	1756.47	434.13
1763.53	434.13	1768.72	434.23	1780.01	434.69	1781.14	434.73	1781.65	434.74
1793.6	434.85	1799.76	434.98	1806.07	434.94	1830.95	434.91	1835.99	434.93
1843.2	434.93	1853.56	434.97	1855.38	434.97	1859.34	434.95	1867.83	434.88
1871.68	434.88	1892.76	434.8	1899.31	434.84	1905.22	434.86	1907.91	434.86
1917.69	434.91	1926.02	435.01	1930.07	435.03	1939.27	435.05	1954.64	435.06
1961.71	435.04	1967.04	435.07	1979.82	435.07	1991.92	435.03	1997.94	435.06
2004.38	435.06	2016.05	434.89	2016.83	434.89	2018.6	434.9	2033.62	435.02
2041.29	434.96	2051.74	434.84	2066.15	434.7	2078.61	434.5	2087.97	434.32
2091.08	434.28	2097.94	434.25	2103.54	434.21	2106.08	434.21	2115.8	434.27
2123.65	434.28	2128.1	434.35	2140.55	434.49	2141.77	434.51	2152.96	434.65
2159.88	434.68	2177.27	434.84	2177.77	434.85	2178	434.85	2196.11	435.05
2202.56	435.09	2213.68	435.13	2227.21	435.12	2231.8	434.94	2239.61	434.9
2249.91	435.05	2252.02	435.04	2264.46	435.59	2268.03	435.65	2286.14	435.6
2289.33	435.56	2296.56	435.52	2301.53	435.46	2303.71	435.46	2313.95	435.42
2321.83	435.49	2326.41	435.5	2338.87	435.33	2339.94	435.33	2351.27	435.4
2358.06	435.37	2363.68	435.44	2375.9	435.51	2376.17	435.51	2388.29	435.55
2393.74	435.58	2411.86	435.44	2413.11	435.41	2415.86	435.37	2429.97	435.11
2437.93	435.05	2448.09	435.15	2450.34	435.16	2455.23	435.17	2466.2	435.21
2487.33	435.38	2512.26	435.47	2520	435.44	2524.73	435.43	2535.16	435.35
2537.19	435.34	2538.12	435.34	2549.59	435.5	2556.23	435.62	2573.8	435.73
2574.03	435.73	2574.52	435.72	2586.49	435.61	2591.92	435.58	2598.96	435.6
2614.49	435.6	2623.84	435.58	2628.15	435.62	2636.25	435.81	2646.26	435.91
2648.61	435.9	2653.85	435.96	2660.78	436.02	2663.83	436.06	2673.18	436.04
2681.95	435.98	2685.65	435.97	2698.12	435.9	2700.06	435.88	2710.58	435.85
2718.18	435.85	2723.05	435.81	2733.79	435.76	2735.5	435.75	2736.29	435.74
2747.67	435.54	2753.86	435.48	2759.94	435.38	2771.98	435.29	2773.15	435.29
2784.81	435.18	2797.27	435.04	2808.21	434.89	2809.74	434.88	2813.12	434.89
2826.32	434.9	2834.4	434.93	2843.89	434.94	2846.6	434.93	2852.48	434.96
2859.04	434.98	2862.01	434.97	2871.5	434.96	2880.12	434.98	2892.45	435.04
2896.43	435.05	2898.24	435.07	2916.35	434.77	2921.26	434.68	2932.42	434.52
2933.46	434.51	2933.92	434.5	2952.04	434.55	2958.26	434.65	2970.15	434.77
2970.67	434.78	2971.78	434.79	2983.13	434.92	2988.27	434.96	3006.38	435.2
3008.02	435.23	3020.19	435.49	3023.95	435.6	3032.51	435.77	3042.07	436
3057.35	436.25	3060.18	436.29	3069.82	436.4	3078.3	436.52	3082.28	436.55
3094.75	436.71	3096.41	436.72	3106.99	436.82	3113.98	436.87	3119.3	436.95
3131.05	437.16	3131.77	437.17	3132.1	437.17	3144.17	437.48	3156.58	437.82

3168.98	438.19	3170.41	438.23	3181.44	438.58	3186.44	438.69	3204.01	438.93
3206	438.94	3218.42	439.05	3222.13	439.04	3230.83	438.94	3240.24	438.92
3243.24	438.88	3255.67	438.66	3258.36	438.62	3268.14	438.74	3276.47	438.63
3280.52	438.6	3292.72	438.53	3294.04	438.5	3305.16	438.37	3317.62	438.27
3329.68	438.43	3330.09	438.44	3330.27	438.44	3342.49	438.29	3348.39	438.29
3354.9	438.2	3366.5	438.23	3367.29	438.22	3369.04	438.21	3379.48	438.13
3384.07	438.13	3391.85	438.2	3402.19	438.16	3404.31	438.16	3409.01	438.05
3416.74	437.93	3420.3	437.54	3429.15	436.75	3438.42	436.43	3441.55	436.19
3448.37	436.12	3453.99	436.01	3456.53	435.89	3466.25	435.51	3474.1	435.3
3478.54	435.31	3488.34	435.44	3491.01	435.47	3492.22	435.49	3503.47	435.78
3510.33	435.97	3528.31	436.64	3528.45	436.65	3546.56	437.43	3553.08	437.7
3564.13	438.28	3565.25	438.32	3577.7	438.98	3582.25	439.5	3590.17	440.53
3600.36	442.08	3602.63	442.5	3607.64	443.56	3615.06	445.11	3618.48	446.45
3627.47	450.49	3636.59	453.78	3639.81	454.45	3647	456.64	3651.97	458.03
3654.16	458.45	3664.39	460.21	3672.28	461.27	3676.86	462	3686.97	464.12
3689.32	464.59	3689.76	464.7	3694.09	466.39	3696.83	466.8	3697.34	466.76
3697.71	466.72	3698.35	466.71						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1384	.06	1452	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1384	1452	690	501	980	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2597

INPUT
Description:
Station Elevation Data num= 471

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.14	14.23	434.39	20.54	433.81	40.1	432.6	41.54	432.48
46.53	432.01	62.22	430.48	66.77	430.13	83.22	430.09	93.45	430.04
103.9	430.21	120.12	430.24	124.9	430.22	145.9	430.39	146.8	430.4
166.58	430.56	172.66	430.62	187.58	430.95	191.94	431.07	196.52	431.22
200.27	431.29	213.03	431.64	217.35	431.7	229.54	431.98	234.43	432.1
246.05	432.16	251.33	432.15	262.05	432.25	268.06	432.32	278.56	432.34
295.07	432.13	302.22	432.09	311.58	432.22	319.29	432.26	328.09	432.17
336.11	432.21	352.93	432.19	360.61	432.2	377.12	432.35	404.16	432.44
410.13	432.41	420.89	432.54	426.14	432.53	437.8	432.46	442.65	432.49
454.88	432.4	471.95	432.36	475.67	432.38	489.03	432.4	492.18	432.4
505.67	432.54	508.19	432.55	522.67	432.59	524.69	432.6	539.74	432.79
541.2	432.8	556.82	433.16	557.71	433.17	573.9	433.06	574.22	433.06
590.23	433.21	590.45	433.21	606.74	433.52	607.52	433.52	623.25	433.44
624.59	433.45	639.76	433.3	641.66	433.32	656.27	433.55	658.65	433.55
672.27	433.68	675.28	433.65	688.78	433.38	709.41	433.26	721.8	433.37
726.48	433.36	743.39	433.22	754.32	433.11	760.1	433.13	770.83	433.15
777.17	433.14	787.34	433.18	794.24	433.18	803.84	433.26	811.3	433.23
836.36	433.07	844.92	432.99	852.87	432.94	869.38	432.77	879.06	432.77
885.89	432.74	896.13	432.79	902.4	432.7	912.86	432.85	918.41	433.03
929.75	432.99	934.91	432.98	946.81	432.93	951.42	432.96	963.88	432.89
980.95	432.72	984.44	432.7	997.59	432.65	1000.45	432.65	1014.57	432.73
1016.96	432.72	1031.64	432.6	1048.71	432.5	1049.98	432.49	1065.77	432.58
1066.49	432.58	1082.33	432.7	1082.49	432.71	1099	432.64	1099.39	432.64
1115.51	432.46	1116.46	432.47	1132.02	432.76	1133.53	432.77	1148.53	432.85
1150.53	432.85	1164.54	432.87	1167.15	432.91	1181.05	433.01	1184.22	433.05
1197.56	433.42	1230.57	433.74	1246.58	433.93	1251.97	433.97	1263.09	434.1
1269.04	434.21	1279.6	434.32	1286.11	434.2	1296.11	434.13	1303.18	433.99
1312.62	433.9	1328.63	433.95	1345.14	434.16	1353.86	434.38	1370.93	434.51
1378.15	434.58	1388	434.48	1394.66	434.39	1404.74	434.4	1410.67	434.47
1421.62	433.65	1434	433.09	1454	428.99	1462	425.37	1469.5	426.15
1487.3	426.68	1491	425.08	1501	425.03	1503.3	426.89	1508	428.03
1524	432.05	1529	432.34	1533	432.48	1542.23	432.61	1557.18	432.77
1558.74	432.79	1573.54	432.65	1574.74	432.64	1590.23	432.57	1591.24	432.56
1606.95	432.63	1607.74	432.63	1623.67	432.72	1624.24	432.72	1640.39	432.83
1640.74	432.83	1656.62	432.85	1673.25	432.83	1673.34	432.83	1689.75	432.9
1690.06	432.9	1706.25	432.95	1706.79	432.95	1722.75	432.82	1723.49	432.82
1738.75	432.8	1739.73	432.79	1755.25	432.7	1756.46	432.7	1771.76	432.6
1773.19	432.57	1788.26	432.49	1795.72	432.49	1800.41	432.5	1804.02	432.5
1805.42	432.51	1816.51	432.57	1829.11	432.67	1841.85	432.74	1845.82	432.77
1854.59	432.86	1858.02	432.86	1875.73	432.94	1880.08	432.99	1891.22	433.1
1892.81	433.12	1893.44	433.12	1905.23	433.26	1910.61	433.3	1917.8	433.33
1928.32	433.31	1930.48	433.3	1943.2	433.3	1955.94	433.44	1963.75	433.46
1981.34	433.3	1981.46	433.3	1993.83	433.24	2016.34	433.36	2019.1	433.36
2026.05	433.57	2031.81	433.68	2034.05	433.74	2044.55	433.95	2051.76	434.13
2057.29	434.18	2069.48	434.31	2070.02	434.29	2071.46	434.24	2082.48	433.77
2086.65	433.63	2095.13	433.46	2104.36	433.07	2107.87	432.98	2120.59	432.97
2122.07	432.96	2123.93	432.9	2125.4	432.88	2168.32	431.7	2181.53	431.68
2197.44	431.53	2246.91	431.46	2297.1	431.03	2297.82	431.01	2298.11	431.01
2310.56	431.12	2315.82	431.18	2323.31	431.12	2333.53	431.18	2335.99	431.16
2342.5	431.21	2348.43	431.22	2350.7	431.21	2361.06	431.14	2373.75	431.15
2386.12	431.12	2387.22	431.12	2399.17	431.08	2403.84	431.01	2411.91	430.99
2421.55	431.1	2424.59	431.11	2432.62	431.25	2437.03	431.32	2438.72	431.3
2449.68	431.71	2456.43	431.73	2462.26	431.67	2487.78	430.84	2491.85	430.94

2500.52	431.03	2509.56	430.99	2513.18	430.95	2522.74	430.8	2525.64	430.76
2526.74	430.75	2538.36	430.5	2544.45	430.45	2562.16	430.4	2563.84	430.4
2568.14	430.42	2576.54	430.43	2589.23	430.58	2601.82	430.63	2614.76	430.62
2626.96	430.68	2632.47	430.77	2639.71	430.84	2650.18	430.92	2652.45	430.95
2658.26	431.07	2665.16	431.18	2667.89	431.21	2677.84	431.27	2685.6	431.34
2690.42	431.37	2702.77	431.56	2702.98	431.56	2728.31	431.68	2748.38	431.62
2755.91	431.62	2773.62	431.65	2779.15	431.67	2790.79	431.68	2791.63	431.69
2793.78	431.7	2808.5	431.82	2817.01	431.87	2826.21	431.88	2829.7	431.89
2842.4	431.86	2843.92	431.87	2861.64	431.93	2867.75	431.99	2880.24	432.25
2892.94	432.4	2896.52	432.45	2918.31	432.49	2928.62	432.56	2931.01	432.58
2931.94	432.59	2943.75	432.67	2966.83	432.75	2968.85	432.79	2974.02	432.84
2981.59	432.95	2984.54	432.95	2994.33	432.97	3002.25	432.96	3007.07	432.99
3019.43	432.94	3019.96	432.94	3032.5	432.91	3037.67	432.91	3045.02	432.69
3054.85	432.45	3057.48	432.39	3064.14	432.19	3070.2	432.03	3078.01	431.98
3096.66	432.03	3106.98	432.18	3107.98	432.19	3121.11	432.19	3125.69	432.07
3133.62	431.92	3142.86	431.98	3146.1	432.06	3154.26	431.96	3158.8	431.92
3160.57	431.93	3171.54	431.96	3178.29	432.09	3184.28	431.96	3196	431.8
3199.66	431.69	3209.77	431.41	3213.71	431.33	3222.31	431.27	3230.88	430.99
3234.86	431.02	3245.07	431	3247.59	431.02	3248.59	431	3260.28	431.35
3266.3	431.33	3272.96	431.35	3284.01	431.64	3285.65	431.68	3289.78	431.81
3298.37	432.02	3301.72	432.12	3310.91	432.12	3318.9	432.24	3323.47	432.22
3335.19	432.31	3336.21	432.32	3337.54	432.32	3372.03	432.35	3374.26	432.34
3379.9	432.3	3386.98	432.23	3389.74	432.22	3399.5	432.15	3406.92	432.12
3412.08	432.08	3424.63	431.93	3424.82	431.93	3425.3	431.92	3442.34	431.81
3450.3	431.78	3460.05	431.77	3463.04	431.76	3488.21	432.14	3494.93	432.25
3500.75	432.27	3512.64	432.24	3513.43	432.24	3515.42	432.27	3526.16	432.39
3530.35	432.46	3538.91	432.64	3548.07	432.73	3556.99	432.78	3560.83	432.81
3638.52	433.16	3640.25	433.16	3650.94	433.18	3652.99	433.19	3665.47	433.19
3670.97	433.22	3688.68	433.2	3690.83	433.21	3703.54	433.38	3706.39	433.43
3716.23	433.67	3724.1	433.79	3741.06	434.01	3741.81	434.01	3758.99	434.14
3766.7	434.17	3776.7	434.3	3786.47	434.48	3792.16	434.56	3794.41	434.57
3804.84	434.72	3812.12	434.67	3817.53	434.57	3830.21	434.56	3831.18	434.57
3842.66	434.63	3855.31	434.71	3864.71	434.74	3868.05	434.71	3876.59	434.41
3880.79	434.29	3882.43	434.19	3893.53	433.42	3900.14	432.95	3906.27	432.72
3917.85	432.66	3918.98	432.71	3921.99	432.99	3931.41	433.94	3935.02	434.24
3944.01	434.97	3952.73	435.27	3956.7	435.38	3966.71	436.05	3969.39	436.2
3970.44	436.29	3982.14	436.81	3988.15	437.36	3994.88	438.09	4005.87	439.54
4007.58	439.88	4012.11	440.56	4020.01	441.91	4023.04	442.56	4032.62	444.75
4040.75	446.25	4045.31	446.94	4056.82	448.58	4058	448.75	4058.46	448.81
4076.17	453.01	4093.88	455.59	4096.17	456	4111.06	458.83	4121.32	460.43
4128.77	461.29	4134.06	462.15	4146.48	463.12	4146.8	463.16	4147.63	463.04
4154.29	461.97								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1434	.06	1524	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1434	1524	760	500	410	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2069	3842	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2097

INPUT
Description:
Station Elevation Data num= 444

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.08	8.65	435.23	17.96	434.13	25.15	432.93	34.18	431.92
41.65	430.74	50.14	430.13	57.66	429.98	66.13	430.05	74.16	430.38
82.36	430.39	90.66	430.57	123.67	430.48	130.81	430.64	139.67	431.04
146.76	431.27	156.17	431.65	162.98	431.74	172.67	431.83	179.2	432.02
189.18	432.13	195.43	432.42	205.68	432.92	211.47	433.17	221.68	433.58
238.18	433.96	243.6	434.03	254.68	434.11	266.15	434.14	276.05	434.37
287.69	434.39	292.14	434.24	303.69	434.21	308.01	434.18	320.19	434.23
324.23	434.21	336.7	434.17	340.45	434.18	353.2	434.24	356.68	434.24
372.8	434.13	385.7	434.12	388.63	434.1	402.21	434.06	421.08	434.19
437.3	434.29	451.71	434.4	453.47	434.4	484.22	434.59	517.92	434.59
533.72	434.65	549.73	434.67	599.23	434.65	630.56	434.71	648.24	434.71
664.74	434.93	679.2	435.01	681.25	435.03	695.43	434.85	697.75	434.83
713.75	434.55	727.39	434.58	730.25	434.57	746.76	434.62	763.26	434.55
776.08	434.43	779.76	434.41	791.93	434.37	795.76	434.35	812.26	434.34
824.27	434.48	828.77	434.54	840.49	434.6	845.27	434.64	861.77	434.69
872.62	434.68	877.77	434.65	888.68	434.67	921.14	434.62	927.28	434.63
937.37	434.58	953.3	434.32	959.79	434.26	969.33	434.23	976.29	434.19
985.56	434.17	992.79	434.13	1009.29	433.83	1018.01	433.69	1033.99	433.51
1041.8	433.52	1049.97	433.5	1074.8	433.18	1082.43	433.2	1091.3	433.18
1107.81	433.26	1114.67	433.27	1123.81	433.23	1130.62	433.24	1140.31	433.17
1146.85	433.14	1156.81	433.02	1163.07	432.99	1173.32	433.06	1179.3	433.13
1189.82	433.29	1195.36	433.36	1205.82	433.52	1211.26	433.57	1222.32	433.69
1227.49	433.76	1238.83	433.94	1243.72	433.97	1255.33	434.09	1259.95	434.09
1276.04	434.05	1287.83	434.08	1291.91	434.14	1304.34	434.28	1320.84	434.37
1324.36	434.36	1337.34	434.22	1340.59	434.15	1353.84	433.72	1369.84	433.17

1372.55	433.11	1386.35	432.92	1405.01	432.82	1419.35	432.78	1421.23	432.73
1437.41	432.24	1451.86	431.85	1453.2	431.83	1456	430.99	1488	430.75
1499	424.13	1501.5	423.25	1506.5	424.27	1512.5	424.85	1535	425.87
1554	431.02	1563	431.64	1577.51	432.04	1578.18	432.09	1602.8	432.42
1614.27	432.5	1617.74	432.51	1631.67	432.5	1640.07	432.41	1652.64	432.45
1665.24	432.41	1678.22	432.41	1684.85	432.37	1691.2	432.36	1702.25	432.42
1704.14	432.42	1719.13	432.6	1729.83	432.71	1736.53	432.64	1742.86	432.52
1753.94	432.33	1755.89	432.31	1761.69	432.33	1768.92	432.34	1771.34	432.33
1781.95	432.23	1788.75	432.23	1794.84	432.26	1805.63	432.27	1823.03	432.1
1833.6	432.04	1840.44	431.96	1846.58	431.92	1857.84	431.96	1864.6	432.05
1875.25	432.24	1885.36	432.29	1892.12	432.24	1898.24	432.25	1909.53	432.32
1911.27	432.41	1916.45	432.49	1926.93	432.71	1937.25	433.05	1944.34	433.1
1950.23	432.9	1961.74	432.76	1967.51	432.65	1975.89	432.47	1978.62	432.46
1988.86	432.46	1996.03	432.4	2001.89	432.4	2013.43	432.38	2027.95	432.17
2030.83	432.15	2040.98	432.28	2048.24	432.31	2053.88	432.27	2065.12	432.26
2071.2	432.21	2079.64	432.12	2082.52	432.12	2092.62	432	2099.93	431.85
2105.6	431.66	2117.33	431.08	2118.59	431.06	2131.6	431.09	2134.74	431.09
2151.61	431.22	2157.27	431.3	2169.02	431.39	2170.3	431.41	2183.29	431.48
2203.83	431.48	2209.26	431.44	2221.23	431.39	2234.93	431.35	2238.11	431.35
2272.92	431.29	2290.33	431.24	2300.01	431.24	2307.73	431.2	2312.92	431.19
2324.61	431.24	2338.67	431.14	2351.65	431.08	2359.42	431.02	2364.63	431.01
2376.82	431.03	2390.63	431.11	2403.45	431.27	2416.3	431.32	2429.33	431.4
2442.32	431.3	2445.92	431.29	2463.32	431.27	2468.28	431.29	2481.25	431.28
2493.98	431.32	2497.6	431.38	2506.92	431.46	2532.41	431.58	2532.98	431.59
2546.01	431.6	2549.82	431.61	2559.04	431.67	2567.22	431.68	2584.1	431.75
2597.7	431.75	2601.5	431.71	2610.68	431.46	2636.31	431.28	2649.67	431.26
2653.72	431.29	2661.5	431.41	2685.2	431.52	2688.36	431.56	2701.35	431.89
2705.41	431.85	2714.33	431.71	2722.81	431.83	2727.31	431.82	2740.5	431.91
2765.95	431.73	2774.5	431.71	2791.68	431.79	2805.05	431.87	2817.88	431.75
2826.71	431.75	2831.01	431.74	2844.19	431.84	2861	431.92	2869.7	431.73
2895.81	431.69	2908.7	431.86	2913.21	431.93	2934.36	432.32	2947.1	432.44
2964.9	432.41	2973.35	432.38	2982.3	432.33	2999.71	432.13	3002.73	432.13
3025.99	432.1	3040.42	432.02	3050.01	432.11	3051.4	432.11	3064.08	431.77
3068.8	431.82	3077.11	431.96	3086.21	431.95	3101.85	432.01	3115.75	431.97
3120.49	432.02	3137.89	432.05	3152.91	430.66	3155.3	430.43	3172.7	430.43
3180.58	430.69	3189.58	430.88	3193.4	430.93	3206.99	431.26	3219.4	431.52
3224.39	431.57	3232.38	431.58	3245.36	431.53	3258.35	431.54	3259.2	431.53
3271.1	431.5	3276.08	431.48	3284.02	431.39	3307.67	431.48	3310.89	431.48
3323.11	431.45	3336.14	431.39	3345.7	431.28	3349.09	431.25	3359.52	431.3
3364.16	431.28	3379.98	431.17	3397.38	430.98	3400.74	430.92	3410.58	430.82
3414.79	430.8	3426.76	430.72	3432.19	430.6	3439.62	430.53	3449.07	430.59
3452.43	430.69	3462.42	430.63	3466.48	430.66	3478.43	430.83	3483.88	430.87
3504.39	431.13	3517.38	431.23	3518.69	431.26	3530.15	431.4	3535.57	431.45
3543.05	431.38	3552.97	431.33	3556.08	431.33	3565.33	431.26	3570.38	431.24
3587.78	431.26	3595.17	431.23	3605.19	431.23	3608.13	431.26	3620.85	431.3
3633.8	431.28	3639.47	431.35	3646.78	431.46	3656.88	431.47	3659.77	431.49
3674.28	431.5	3685.79	431.44	3698.66	431.31	3720.09	431.29	3725.97	431.3
3737.45	431.38	3743.37	431.38	3750.43	431.42	3760.78	431.43	3763.41	431.42
3776.41	431.48	3789.19	431.32	3812.46	431.12	3815.11	431.12	3847.27	431.25
3864.68	431.22	3879.89	431.14	3892.83	431.14	3898.96	431.2	3905.81	431.22
3918.79	431.23	3931.79	431.13	3933.77	431.1	3944.82	431.11	3951.18	431.14
3957.7	431.14	3968.05	431.18	3970.49	431.17	3983.5	431.16	3985.46	431.14
4020.27	431.04	4035.45	430.99	4037.67	430.97	4048.23	430.8	4061.11	430.73
4071.96	430.64	4074.14	430.63	4087.17	430.52	4089.36	430.48	4100.2	430.23
4106.77	430.2	4113.23	430.07	4124.17	430.96	4126.22	431.15	4132.5	431.34
4138.93	431.56	4141.05	431.73	4151.86	432.87	4158.45	433.11	4164.84	433.31
4177.82	433.54	4183.56	433.59	4193.26	433.69	4203.86	433.84	4210.67	433.96
4216.74	434.09	4229.52	434.39	4242.52	434.61	4244.95	434.69	4255.51	435.1
4262.35	435.52	4276.29	436.85	4279.76	437.1	4281.47	437.32	4286.47	438.22
4294.48	439.63	4297.16	440.18	4307.27	443	4314.04	444.8	4320.14	446.35
4331.45	449.13	4333.17	449.47	4346.2	452.36	4348.85	453.01	4359.23	455.1
4366.26	456.5	4372.27	457.89	4383.66	461	4385.26	461.53	4390.16	462.71
4397.96	464.72	4400.54	465.02	4410.88	465.76	4417.94	465.67	4423.86	465.02
4435.35	463.54	4436.84	463.33	4443.7	462.73	4444.4	462.77		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1488	.06	1554	.1

Bank Sta: Left 1488 Right 1554

Lengths: Left 460 Channel 497 Right 900

Coeff Contr. .1 Expan. .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
280	1320	436	F
1944	3775	436	F

CROSS SECTION

RIVER: Thompsons RS: 1600
REACH: Thompsons

INPUT
Description:
Station Elevation Data num= 449

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.32	2.04	436.18	18.54	433.35	26.39	431.64	35.04	429.99
51.54	427.75	59.58	428.01	68.04	428.15	75.93	428.7	84.04	429.35

92.27	429.5	100.54	429.61	117.04	429.58	133.54	429.8	142.06	430.15
150.04	430.41	158.39	431.02	166.04	431.61	174.75	432.16	182.54	432.52
191.35	432.77	199.04	433.2	215.54	433.45	224.54	433.45	240.86	433.63
248.04	433.66	257.23	433.62	264.54	433.72	273.83	433.74	281.04	433.7
290.43	433.72	297.54	433.8	307.02	433.81	323.33	433.76	330.04	433.78
339.71	433.88	346.54	433.87	356.31	433.76	363.04	433.72	372.91	433.72
379.54	433.69	389.5	433.67	396.04	433.6	405.79	433.55	412.04	433.57
428.54	433.36	438.79	433.2	445.04	433.08	455.39	433.08	461.54	433.05
471.99	432.89	478.04	432.82	494.04	432.58	510.54	432.5	521.27	432.54
527.04	432.61	543.55	433.17	554.47	433.26	560.05	433.28	570.73	433.43
576.05	433.54	587.16	433.46	592.55	433.36	609.05	433.23	620.35	433.02
625.55	432.88	636.95	432.73	653.19	432.65	658.05	432.64	669.64	432.53
686.24	432.28	691.05	432.19	702.83	432.1	707.55	432.11	719.43	432.35
724.05	432.42	735.66	432.71	740.05	432.78	752.12	432.88	756.55	432.9
773.05	433.03	785.31	433.1	789.55	433.16	806.05	433.36	822.05	433.52
834.6	433.66	838.55	433.69	855.05	433.72	871.55	433.51	888.05	432.95
900.6	432.46	904.05	432.34	917.08	432.38	920.55	432.38	933.68	432.8
937.05	432.89	953.55	433.06	970.05	433.14	983.06	433.35	986.05	433.38
1002.55	433.62	1016.16	433.97	1019.05	434.02	1032.76	434.17	1035.55	434.22
1052.05	434.37	1068.05	434.41	1082.05	434.62	1101.05	434.99	1117.55	435.43
1131.84	435.66	1150.06	436.07	1166.56	436.22	1181.12	436.32	1183.06	436.35
1197.72	436.44	1214.32	436.56	1232.06	436.65	1249.82	436.68	1257.04	436.66
1270.87	436.66	1281.44	436.59	1287.05	436.57	1293.61	436.5	1305.99	436.44
1317.75	436.31	1323.71	436.28	1329.86	436.2	1341.65	436.16	1354.32	435.7
1360.93	435.39	1366.55	435.1	1379.54	434.22	1390.94	433.83	1398.16	433.57
1403	433.31	1412.43	432.97	1414.94	432.92	1427.14	433.02	1434.82	432.96
1439.37	432.86	1453.43	432.93	1463.75	432.67	1472.04	432.43	1475.91	432.4
1488.1	432.36	1490.65	432.37	1500.14	432.29	1508.7	432.33	1513.21	432.26
1525.28	432.14	1541.78	432.23	1546.64	432.22	1558.28	432.27	1561	432.48
1581	432.28	1596	428.55	1604.5	425.23	1609	423.21	1617	422.71
1631	423.86	1634.3	426.17	1649.6	430.38	1655	430.9	1661	431.03
1672.82	431.26	1680.52	431.34	1689.32	431.45	1696.86	431.4	1705.82	431.43
1713.19	431.64	1722.32	431.88	1731.63	431.57	1745.65	431.33	1764.47	431.33
1773.59	431.14	1784.61	431.08	1796.25	430.85	1804.89	430.7	1814.59	430.7
1821.26	430.8	1823.67	430.76	1830.71	430.85	1892.63	431.85	1907.82	431.88
1917.09	431.86	1930.3	431.92	1946.12	431.93	1952.96	431.97	1962.73	431.99
1985.47	432.14	1998.61	432.15	2010.7	432.17	2015.16	432.21	2036.17	432.24
2050.47	432.17	2061.74	432.25	2068.13	432.18	2073.63	432.17	2093.82	432.17
2099.83	432.13	2113.15	432.49	2121.19	432.64	2138.22	434.15	2155.87	434.61
2164.19	434.84	2173.53	435.08	2184.72	435.13	2188.83	435.26	2216.38	432.37
2263.44	432.45	2282.5	432.42	2293.34	432.43	2313.71	432.41	2331.37	432.25
2349.02	432.25	2366.15	432.02	2417.61	432.46	2419.12	432.48	2436.77	432.48
2459.36	431.97	2468.19	431.69	2471.55	431.69	2489.21	431.99	2493.76	432.04
2505.72	431.99	2506.86	432	2519.33	432.57	2524.52	432.52	2531.95	432.48
2541.64	432.52	2544.52	432.44	2552.07	432.4	2557.28	432.35	2570.01	432.33
2576.95	432.29	2594.61	432.45	2608.26	432.61	2620.85	432.63	2633.44	432.61
2647.04	432.67	2658.95	432.55	2671.68	432.55	2684.41	432.59	2697.18	432.54
2700.01	432.54	2709.74	432.49	2717.13	432.49	2722.36	432.45	2734.79	432.49
2760.72	432.46	2773.51	432.51	2787.76	432.5	2798.76	432.45	2811.36	432.45
2822.54	432.4	2836.86	432.37	2849.65	432.42	2862.43	432.45	2875.51	432.58
2887.67	432.61	2910.28	432.49	2920.11	432.4	2925.78	432.32	2927.94	432.32
2938.57	432.24	2951.35	432.2	2966.47	432.14	2976.62	432.08	2980.37	432.08
2998.03	432.14	3012.83	432.36	3027.62	432.64	3033.34	432.78	3046.78	432.62
3071.06	432.29	3103.1	432.6	3104.84	432.59	3118.47	432.26	3153.01	433.5
3154.4	433.61	3155.87	433.5	3169.84	433.33	3173.52	433.27	3187.7	432.66
3191.18	432.48	3196.85	432.51	3205.53	432.64	3208.84	432.64	3218.32	432.7
3226.49	432.77	3256.23	432.79	3261.27	432.85	3268.96	432.74	3278.93	432.77
3288.86	432.76	3294.45	432.73	3296.58	432.64	3307.24	432.53	3314.24	432.57
3319.9	432.49	3331.36	432.46	3335.21	432.47	3345.17	432.57	3349.02	432.55
3357.9	432.64	3370.63	432.66	3384.33	432.83	3396.16	432.86	3408.79	432.96
3419.11	433.96	3421.35	433.99	3427.22	435.43	3434.13	436.92	3436.76	436.92
3439.03	436.43	3442.71	436.27	3485.01	433.43	3492.47	433.07	3506.85	433.07
3524.51	432.99	3535.84	433.06	3542.17	433.03	3559.82	433.09	3565.59	432.99
3577.48	432.7	3586.69	432.51	3594.6	432.48	3599.24	432.54	3611.24	432.66
3629.91	433.02	3647.57	433.2	3650.34	433.25	3663.12	433.36	3675.67	433.34
3682.35	433.31	3688.31	433.31	3700	433.38	3717.66	433.44	3735.32	433.47
3739.3	433.5	3752.97	433.54	3764.57	433.5	3770.09	433.54	3777.23	433.55
3790.02	433.43	3795.96	433.43	3805.41	433.39	3823.06	433.33	3828.24	433.39
3841.62	433.35	3853.46	433.41	3857.84	433.41	3875.5	433.24	3887.97	433.26
3904.51	433.3	3917.3	433.38	3928.47	433.4	3934.33	433.35	3945.59	433.22
3955.18	433.03	3963.24	432.94	3980.9	432.88	3993.43	432.93	4006.22	433.03
4026.34	433.1	4031.43	433.11	4044.11	433.22	4056.85	433.25	4068.65	433.24
4082.35	433.14	4086.3	433.13	4103.96	433.24	4121.08	433.3	4133.11	433.31
4158.68	433.12	4171.44	433.08	4174.05	433.06	4184.17	433.1	4191.71	433.16
4196.79	433.22	4208.83	433.33	4222.03	433.4	4226.48	433.38	4234.82	433.44
4247.61	433.38	4261.79	433.35	4273.11	433.18	4279.45	433.12	4285.7	433.14
4296.57	433.13	4302.37	433.15	4314.23	433.16	4323.74	433.02	4348.72	433.08
4362.1	433.07	4367.2	433.04	4387.29	433.05	4401.98	433	4419.63	432.73
4425.52	432.66	4440.73	432.57	4451.02	432.48	4454.94	432.48	4463.61	432.4
4472.07	432.16	4476.21	431.99	4487.09	431.7	4488.99	431.61	4501.72	430.51
4507.38	429.85	4514.45	428.93	4525.04	429.42	4527.19	429.43	4532.74	430.12
4539.95	430.88	4552.51	432.9	4559.81	433.66	4565.13	434.42	4577.47	435.03
4590.71	435.43	4603.49	435.85	4612.78	436.06	4616.28	436.12	4630.44	436.28
4641.53	436.39	4647.56	436.5	4654.13	436.67	4666.86	437.19	4679.63	438.12
4682.87	438.51	4692.41	439.8	4700.53	441.99	4705.2	443.3	4718.19	446.37
4730.44	449.57	4735.31	450.92	4743.06	453.26	4752.96	456.67	4763.12	460.37
4768.55	462.37	4770.62	462.94	4781.34	465.4	4788.27	465.61	4794.12	465.66
4805.93	464.69	4811.01	464.19	4814.68	463.42	4826.65	463.33		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1581	.06	1655	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1581	1655	700	502	530	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
340	1250	438	F
2173	4248	438	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1098

INPUT
Description:
Station Elevation Data num= 448

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.02	13,11	433.96	29.61	430.92	46.11	428.9	62.69	428.9
79.12	429.17	95.12	429.51	128.13	429.27	146.54	429.46	177.14	429.87
179.77	429.88	193.65	430.01	196.64	430.11	210.15	430.39	213.52	430.39
226.66	430.48	243.16	430.7	247.13	430.73	259.16	430.9	263.62	431.11
275.67	431.57	280.49	431.99	292.17	432.68	297.36	432.78	308.68	433.2
314.23	433.23	325.18	433.19	330.92	433.12	347.47	433.16	357.69	433.11
374.19	433.18	381.21	433.25	390.69	433.23	398.08	433.24	407.2	433.39
423.2	433.31	431.31	433.35	439.71	433.45	456.21	433.7	472.71	433.77
481.93	433.97	489.22	434.09	498.5	434.29	505.22	434.35	515.16	434.3
521.73	434.33	532.03	434.2	548.91	434.13	554.73	434.13	565.78	434.28
571.24	434.32	582.3	434.36	587.24	434.4	599.01	434.37	603.75	434.34
615.88	434.22	632.75	434.07	653.26	434.04	669.26	433.94	685.76	433.72
716.6	433.58	733.47	433.55	751.28	433.49	766.7	433.59	784.29	433.63
800.45	433.42	817.3	433.32	833.68	433.32	867.42	432.87	882.81	432.8
884.3	432.9	901.11	433.83	915.32	434.78	917.53	434.82	931.82	435.18
951.27	435.27	964.83	435.31	968.14	435.35	981.34	435.39	997.34	435.7
1001.37	435.76	1013.84	435.88	1018.25	435.87	1030.35	435.94	1046.85	436.18
1063.35	436.39	1079.36	436.43	1085.22	436.36	1102.09	436.36	1118.96	436.47
1128.87	436.55	1135.84	436.68	1145.37	436.81	1152.48	436.95	1185.94	437.52
1210.89	437.71	1219.68	437.56	1227.39	437.49	1236.27	437.19	1243.4	437.03
1252.92	436.97	1259.9	436.86	1269.79	436.76	1276.41	436.63	1286.66	436.34
1292.91	436.19	1303.53	435.99	1309.41	435.93	1320.06	435.77	1336.76	435.57
1341.92	435.49	1353.64	435.45	1370.51	435.45	1374.93	435.48	1387.38	435.19
1391.43	435.08	1403.85	434.94	1407.44	434.92	1420.61	434.1	1423.94	433.95
1440.44	432.74	1454.36	432.85	1456.95	432.83	1471.23	431.98	1487.65	431.78
1489.46	431.72	1504.46	430.99	1505.96	430.95	1516	430.07	1545	427.65
1551	425.31	1557	423.95	1561	421.7	1569.7	421.84	1574	424.39
1596	424.21	1614	426.1	1634	429.93	1637.47	429.77	1653.54	430.68
1667.47	430.55	1670.27	430.55	1681.8	430.31	1686.99	430.16	1696.14	430.35
1703.72	430.34	1710.47	430.19	1724.69	430.19	1736.67	430.22	1738.71	430.3
1753.04	430.26	1767.38	430.71	1770.13	430.73	1781.72	430.6	1786.86	430.68
1796.05	430.7	1803.58	430.76	1810.21	431.1	1819.92	431.34	1823.68	431.34
1837.05	431.05	1850.44	431.19	1863.79	431.2	1877.15	431.3	1888.43	431.28
1905.03	431.1	1922.16	431.15	1930.27	431.26	1943.67	431.36	1959.41	431.53
1970.43	431.68	1983.54	431.64	1990.15	431.66	1996.73	431.58	2007.27	431.77
2020.04	431.83	2023.45	431.82	2036.85	431.68	2041.53	431.65	2050.25	431.38
2058.65	431.45	2063.53	431.56	2076.64	431.51	2090.04	431.62	2103.44	431.34
2116.84	431.4	2130.24	431.39	2143.77	431.57	2156.68	431.67	2160.38	431.59
2177.5	431.61	2183.29	431.56	2196.65	431.55	2211.75	431.67	2223.42	431.59
2228.88	431.62	2236.63	431.59	2249.82	431.71	2262.62	431.7	2276.58	431.55
2279.74	431.54	2289.93	431.58	2296.87	431.57	2303.29	431.6	2316.58	431.53
2330.6	431.84	2347.73	431.84	2356.4	431.59	2364.86	431.37	2369.8	431.34
2381.98	431.32	2383.2	431.35	2396.6	431.36	2399.11	431.39	2409.74	431.84
2415.72	432.12	2422.99	432.28	2432.84	432.47	2436.39	432.41	2449.97	431.99
2463.14	431.89	2474.17	431.64	2484.22	431.12	2500.83	431.68	2502.8	431.73
2509.76	431.68	2516.17	431.68	2517.96	431.73	2537.04	432.64	2552.21	432.47
2556.37	432.37	2569.34	432.51	2582.8	432.45	2596.08	432.19	2603.07	432.36
2609.43	432.37	2620.2	432.52	2626.41	432.48	2631.96	432.48	2671.75	432.06
2688.18	432.17	2716.14	432.17	2722.44	432.15	2742.86	432.04	2773.3	432.05
2782.64	431.96	2796	432.15	2807.55	432.03	2809.35	432.05	2824.68	432.04
2835.85	432.14	2841.28	432.14	2849.12	432.24	2858.41	432.48	2875.54	432.56
2889.28	432.34	2892.66	432.36	2902.63	432.35	2909.79	432.37	2915.84	432.46
2926.4	432.49	2928.94	432.45	2943.53	432.46	2955.7	432.53	2960.65	432.62
2978.58	433.01	2981.26	433.05	2993.57	433.01	2997	433.15	3005.7	433.19
3014.86	432.84	3023.77	433.04	3030.09	433.23	3033.28	433.16	3051.71	433.2
3070.13	433.09	3088.55	433.21	3103.46	433.2	3106.41	433.18	3115.64	433.01
3124.84	433.06	3133.95	433.03	3143.26	432.96	3152.48	432.97	3164.79	432.88
3177.1	433	3180.1	432.96	3189.22	432.91	3197.97	432.92	3201.34	432.9
3213.63	432.99	3216.39	432.96	3234.81	432.94	3253.23	433.08	3262.71	433.01
3281.78	433.02	3289.52	432.97	3299.17	432.98	3307.94	433.17	3311.42	433.18
3323.7	433.07	3336.01	433.2	3344.79	432.89	3348.31	432.93	3355.42	432.95
3360.62	433.14	3381.07	433.13	3406.76	434.32	3421.65	434.77	3429.06	434.64
3433.92	434.47	3436.34	434.51	3446.23	434.52	3466.16	434.5	3472.62	434.51
3479.1	434.48	3509.47	433.5	3512.84	433.6	3521.53	433.62	3552.34	434.24
3568.08	433.64	3583.51	432.62	3593.48	431.83	3600.27	431.27	3621.92	433.32
3667.67	433.86	3674.15	433.97	3727.67	433.34	3763.5	434.26	3765.7	434.03

3767.18	433.99	3770.21	433.6	3784.13	432.78	3788.71	432.46	3797.81	432.39
3802.55	432.6	3813.29	433.16	3820.97	433.16	3825.5	433.33	3837.55	433.72
3849.77	433.84	3862.02	433.67	3874.28	434	3886.59	434.77	3894.1	435.12
3898.9	435.01	3908.55	435.16	3911.21	435.13	3923.29	434.73	3926.13	434.58
3937.67	434.28	3996.78	434.12	3999.7	434.04	4004.08	434.58	4009.02	434.51
4021.94	434.23	4033.3	434.24	4040.36	433.67	4043.46	433.33	4058.79	431.1
4063.66	430.86	4108.11	444.04	4117.99	444.52	4141.37	443.33	4149.18	442.86
4160.46	441.07	4205.05	440.12	4211.61	440.48	4223.47	441.84	4234.22	444.43
4265.24	442.08	4314.69	434.98	4323.89	434.74	4327.06	434.77	4333.44	434.76
4350.95	434.62	4363.87	434.65	4376.06	434.6	4388.05	434.74	4406.58	434.86
4425	434.86	4443.42	434.57	4449.48	434.52	4461.69	434.46	4473.85	434.42
4479.71	434.43	4486.04	434.4	4510.6	434.15	4516.55	434.12	4522.84	434.14
4535.32	434.12	4553.39	434.27	4571.26	434.29	4583.9	434.23	4596.14	434.25
4620.7	434.22	4633.01	434.12	4662.81	433.72	4681.23	433.38	4699.65	432.88
4719.7	432.22	4730.93	431.82	4736.5	431.71	4743.1	431.4	4755.17	430.97
4767.43	430.31	4779.67	430.09	4791.21	428.76	4804.22	427.73	4809.63	427.72
4816.53	428.05	4828.05	429	4828.83	429.04	4845.92	431.31	4853.09	432.2
4864.34	433.52	4865.4	433.7	4867.54	433.86	4877.66	434.77	4882.76	435.17
4901.18	436.18	4919.6	437.8	4926.62	437.97	4937.47	438.14	4950.96	438.58
4955.89	438.68	4963.21	439.45	4974.31	442.05	4977.72	442.56	4987.75	444.13
4992.74	444.87	5000.06	446.21	5011.16	448.64	5012.35	449.01	5014.82	450.05
5024.4	453.93	5029.02	456.2	5036.62	458.98	5047.44	462.02	5048.93	462.46
5051.92	463.17	5061.19	465.58	5073.44	465.15	5084.29	463.43	5088.85	462.62
5090.54	462.65	5091.15	462.52	5099.68	462.51				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1545	.06	1634	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1545	1634	510	360	381	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2330	4108	438	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 738

INPUT
Description:
Station Elevation Data num= 450

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	434.97	8.43	433.71	24.06	429.99	25.28	429.72	29.91	429.31
42.12	428.3	45.28	428.45	58.97	428.95	66.47	429.3	75.81	429.79
87.22	429.51	108.99	429.11	125.83	429.53	142.68	430.06	159.52	430.34
171.58	430.86	175.86	430.99	192.7	431.16	213.89	431.3	226.39	431.23
235.09	431.32	243.23	431.35	255.79	431.49	274.74	431.45	276.84	431.43
293.26	431.59	298.04	431.67	310.1	431.65	319.24	431.78	339.92	431.83
343.28	431.88	356.77	431.95	361.01	431.95	376.97	432.54	382.29	432.51
393.81	432.95	403.57	433.02	410.66	432.44	424.31	432.97	426.99	432.95
437.55	432.99	445.46	432.92	460.68	432.56	466.66	432.46	487.85	432.04
494.37	432	510.7	432.01	519.57	432.15	526.17	432.29	540.11	432.48
544.39	432.48	561.23	432.34	567.98	432.22	581.82	432.13	611.26	431.71
628.1	431.5	635.27	431.43	656.47	431.3	661.79	431.29	678.12	431.15
682.38	431.14	711.81	431.22	719.42	431.22	740.62	431.37	745.5	431.42
760.66	431.67	767.94	431.89	778.46	432.25	795.15	433.12	811.85	433.52
820.07	433.57	828.55	433.67	839.49	433.53	844.74	433.42	859.12	433.64
861.44	433.65	873.8	434.1	878.93	434.26	894.83	434.68	911.53	434.79
927.72	434.99	937.64	435.05	944.42	435.14	957.41	435.14	977.82	435.44
994.52	435.33	1010.71	435.5	1016.22	435.54	1027.41	435.73	1044.1	435.89
1055.87	435.95	1077.5	436.01	1094.89	436.23	1127.09	436.57	1134.43	436.72
1143.78	436.86	1160.48	437.2	1176.67	437.36	1193.14	437.27	1210.07	437.29
1212.91	437.26	1226.77	437.22	1232.68	437.11	1243.47	436.85	1252.12	436.57
1259.66	436.36	1271.61	436.22	1276.36	436.1	1293.05	435.81	1309.75	435.76
1326.45	435.35	1342.64	435.26	1359.34	435.14	1376.04	435.06	1392.74	434.95
1409.43	434.73	1428.87	433.33	1442.3	431.88	1447.7	430.89	1458.83	429.19
1540.72	425.34	1574.1	423.67	1590.14	422.57	1606.68	421.76	1623.22	423.27
1624.13	423.44	1639.75	426.67	1641.89	427.14	1656.29	429.6	1659.55	429.83
1672.33	431.04	1676.89	431.05	1688.87	431.14	1705.41	430.51	1714.76	430.94
1729.98	431.3	1744.14	431.39	1754.87	431.37	1771.65	431.14	1786.3	431.08
1788.43	431.04	1800.47	431.02	1805.2	431.07	1814.64	431.09	1821.98	430.98
1828.63	430.84	1838.25	430.89	1842.55	430.84	1855.03	430.89	1885.01	430.94
1888.58	430.91	1899.15	430.98	1905.36	431.33	1913.08	431.6	1921.63	431.55
1938.4	431.9	1955.74	431.92	1969.44	432.05	1983.61	432.07	1988.73	432.11
2005	432.11	2011.52	432.16	2025.69	432.2	2038.55	432.28	2054.03	432.27
2072.11	432.35	2082.1	432.34	2105.15	432.18	2155.48	431.86	2166.6	431.91
2171.75	431.88	2180.6	431.93	2188.53	432.02	2208.87	431.96	2237.17	431.97
2238.86	431.96	2255.13	432.12	2265.08	432.24	2271.91	432.36	2279.25	432.37
2288.68	432.23	2293.42	432.3	2305.46	432.04	2319.15	435.05	2322.24	435.76
2335.54	433.57	2338.51	433.23	2349.6	432.51	2355.28	431.84	2363.73	431.69
2372.06	431.35	2377.87	431.27	2388.84	431.33	2406.13	431.21	2432.38	430.9
2438.66	430.71	2448.21	430.55	2455.44	430.33	2472.21	430.24	2476.55	430.36
2488.99	431.07	2490.68	431.06	2500.16	431.24	2505.26	431.3	2518.64	431.17
2522.03	431.25	2532.81	431.19	2538.81	431.19	2546.98	431.62	2555.59	432.69
2561.15	432.75	2572.37	433.24	2575.24	433.28	2588.63	432.09	2589.37	432.09

2611.84	431.11	2622.19	431.12	2627.19	431.03	2643.23	431.17	2672.01	431.98
2681.17	431.8	2701.77	431.3	2715.94	431.17	2722.34	431.18	2730.11	431.53
2739.12	431.66	2744.15	431.67	2755.39	432.09	2772.37	432.15	2786.33	431.93
2800.47	432.08	2805.72	432.04	2814.6	432.04	2822.49	431.93	2828.58	431.8
2854.01	431.85	2856.58	431.9	2862.19	431.74	2872.32	431.58	2884.91	431.85
2889.09	431.86	2905.87	431.77	2913.06	431.98	2922.14	432.1	2926.99	432.1
2941.16	432.23	2972.47	432.37	2989.25	432.6	3005.51	432.88	3022.29	433.06
3025.75	433.12	3039.07	433.2	3054.07	433.13	3072.62	433.16	3082.09	433.78
3088.89	433.84	3096.05	433.85	3105.67	433.82	3122.44	433.88	3134.4	433.5
3139.22	433.41	3152.19	433.84	3164.06	433.69	3176.18	433.7	3187.8	433.67
3194.94	433.59	3214.22	433.53	3223.73	433.55	3235.74	433.69	3252.8	433.55
3259.64	433.56	3295.31	433.24	3302.68	433.07	3310.07	432.96	3319.3	432.9
3331.32	432.88	3359.9	433.28	3372.48	435.42	3388.52	434.11	3397.79	433.5
3405.92	433.6	3414.87	433.6	3425.21	433.76	3426.89	434.11	3429.66	434.24
3438.85	435.24	3444.5	434.91	3450.68	435.28	3453.56	435.01	3462.66	436.45
3518.84	441.14	3521.06	441.05	3524.29	441.31	3540.35	441.31	3556.15	440.27
3569.97	440	3578.34	438.96	3581.99	438.58	3593.97	437.19	3597.63	437.48
3605.91	437.71	3616.91	434.56	3619.4	434.38	3636.2	433.48	3641.77	432.63
3654.9	431.34	3674.19	429.5	3682.65	430.61	3689.39	432.37	3693.48	432.27
3710.08	432.31	3716.71	432.42	3754.75	433.3	3770.04	433.79	3777.76	433.97
3789.33	434.1	3796.98	434.04	3808.61	434.28	3809.63	434.26	3827.9	433.17
3832.8	433.06	3846.6	433.57	3856.51	433.64	3865.89	433.79	3872.87	433.87
3885.18	433.96	3892.55	433.97	3904.46	433.91	3916.51	434.62	3923.75	434.77
3928.37	435.08	3936.12	435.01	3942.45	435.17	3952.08	436.58	3961.74	436.12
3967.99	435.69	3976.06	435.54	3981.03	436.03	3988.01	436.58	3999.37	434.71
4000.31	434.65	4016.19	434.94	4023.1	434.61	4050.23	434.58	4071.21	435.07
4076.88	434.99	4094.48	434.86	4096.16	434.88	4107.54	434.82	4115.45	434.89
4133.92	434.85	4169.91	434.84	4190.86	434.73	4211.3	434.73	4239.23	434.37
4245.79	434.77	4268.72	434.78	4277.31	434.85	4301.26	436.37	4355.41	436.19
4364.43	435.78	4379.82	435.55	4382.25	435.48	4393.01	433.84	4438.54	432.18
4457.01	431.12	4479.56	430.4	4489.65	430.4	4498.85	430.96	4501.61	431.16
4506.32	431.35	4517.55	431.92	4525.33	432.14	4536.84	432.32	4544.49	432.86
4556.13	433.91	4563.77	434.07	4575.42	433.95	4632.59	435.54	4644.75	435.37
4651.98	435.32	4668.78	435.31	4680.8	435.19	4692.77	435.12	4704.51	434.96
4728.54	434.79	4747.83	434.5	4764.33	434.19	4776.28	434.07	4786.41	434.11
4799.96	433.83	4805.11	433.63	4811.87	433.16	4824.4	432.49	4835.9	431.96
4843.68	431.55	4847.91	431.16	4854.91	430.72	4859.9	430.33	4862.97	430.23
4871.85	429.17	4882.26	426.43	4883.76	426.12	4886.29	425.9	4895.53	425.39
4900.96	424.97	4907.44	425.42	4918.15	427.21	4920.25	427.59	4931.39	428.87
4939.53	429.06	4948.91	430.4	4953.08	430.93	4981.4	432.83	5001.46	432.95
5013.27	433.07	5026.27	433.16	5044.65	434.24	5051	434.38	5073.96	435.77
5076.52	435.88	5092.66	435.97	5098.46	435.95	5107.9	436.01	5122.43	435.99
5134.45	435.91	5146.46	435.96	5158.48	435.93	5169.81	435.83	5182.21	435.53
5194.03	435.29	5207.8	435.26	5218.01	435.18	5227.08	435.14	5234.88	436.92
5256.6	442.18	5266.26	445.64	5280.4	449.23	5298.12	456.07	5304.31	457.87
5322.93	465.09	5325.59	465.39	5329.99	465.51	5337.56	465.54	5342.22	465.18
5349.51	465.14	5361.51	464.82	5373.24	463.05	5374.19	462.79	5388.84	462.77

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1458.83	.06	1672.33	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1458.83	1672.33	0	0	0	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
394	1160	438	F
1730	4632	438	F

SUMMARY OF MANNING'S N VALUES

River:Thompsons

Reach	River Sta.	n1	n2	n3
Thompsons	4901	.1	.06	.1
Thompsons	4602	.1	.06	.1
Thompsons	4104	.1	.06	.1
Thompsons	3597	.1	.06	.1
Thompsons	3098	.1	.06	.1
Thompsons	2597	.1	.06	.1
Thompsons	2097	.1	.06	.1
Thompsons	1600	.1	.06	.1
Thompsons	1098	.1	.06	.06
Thompsons	738	.1	.06	.06

SUMMARY OF REACH LENGTHS

River: Thompsons

Reach	River Sta.	Left	Channel	Right
Thompsons	4901	300	299	290

Thompsons	4602	517	498	440
Thompsons	4104	650	507	490
Thompsons	3597	510	499	584
Thompsons	3098	690	501	980
Thompsons	2597	760	500	410
Thompsons	2097	460	497	900
Thompsons	1600	700	502	530
Thompsons	1098	510	360	381
Thompsons	738	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Thompsons

Reach	River Sta.	Contr.	Expan.
Thompsons	4901	.1	.3
Thompsons	4602	.1	.3
Thompsons	4104	.1	.3
Thompsons	3597	.1	.3
Thompsons	3098	.1	.3
Thompsons	2597	.1	.3
Thompsons	2097	.1	.3
Thompsons	1600	.1	.3
Thompsons	1098	.1	.3
Thompsons	738	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Thompsons	4901	100 year	2740.00	429.25	438.40		438.77	0.005306	5.48	752.07	257.57	0.41
Thompsons	4901	25 year	2170.00	429.25	437.89		438.22	0.005173	5.06	624.18	245.36	0.40
Thompsons	4901	10 year	1820.00	429.25	437.50		437.81	0.005286	4.84	529.83	237.62	0.40
Thompsons	4901	5 year	1510.00	429.25	437.09		437.39	0.005470	4.66	434.37	227.69	0.40
Thompsons	4901	2 year	1050.00	429.25	436.34		436.62	0.005581	4.26	279.47	186.79	0.40
Thompsons	4602	100 year	2680.00	428.20	437.41		437.62	0.002698	4.29	997.28	299.03	0.30
Thompsons	4602	25 year	2190.00	428.20	436.92		437.11	0.002640	4.02	852.28	287.25	0.30
Thompsons	4602	10 year	1850.00	428.20	436.52		436.70	0.002609	3.81	741.45	275.20	0.29
Thompsons	4602	5 year	1530.00	428.20	436.11		436.27	0.002583	3.59	629.56	261.58	0.29
Thompsons	4602	2 year	1060.00	428.20	435.34		435.49	0.002595	3.22	443.90	225.39	0.28
Thompsons	4104	100 year	2680.00	428.86	435.10	433.63	435.56	0.007417	5.86	656.79	1395.02	0.48
Thompsons	4104	25 year	2190.00	428.86	434.71	433.06	435.12	0.006913	5.43	547.62	1347.72	0.46
Thompsons	4104	10 year	1850.00	428.86	434.42	432.66	434.78	0.006418	5.05	474.76	1315.13	0.44
Thompsons	4104	5 year	1530.00	428.86	434.15	432.28	434.46	0.005625	4.58	415.41	1240.18	0.41
Thompsons	4104	2 year	1060.00	428.86	433.60	431.68	433.82	0.004532	3.82	314.88	934.03	0.36
Thompsons	3597	100 year	2870.00	427.73	434.93	432.07	434.94	0.000324	1.28	4746.30	2370.66	0.10
Thompsons	3597	25 year	2290.00	427.73	434.50	431.90	434.50	0.000338	1.25	3989.15	1834.57	0.10
Thompsons	3597	10 year	1910.00	427.73	434.15	431.77	434.16	0.000357	1.27	3445.95	1657.45	0.10
Thompsons	3597	5 year	1580.00	427.73	433.83	431.65	433.84	0.000381	1.26	2973.66	1580.91	0.11
Thompsons	3597	2 year	1100.00	427.73	433.19	431.26	433.20	0.000432	1.24	2067.82	1453.99	0.11
Thompsons	3098	100 year	2870.00	425.77	434.73		434.75	0.000449	1.79	3987.63	1777.97	0.12
Thompsons	3098	25 year	2290.00	425.77	434.28		434.30	0.000467	1.74	3239.97	1571.57	0.12
Thompsons	3098	10 year	1910.00	425.77	433.92		433.94	0.000502	1.73	2710.81	1367.80	0.13

Thompsons	3098	5 year	1580.00	425.77	433.59		433.61	0.000531	1.71	2282.06	1218.80	0.13
Thompsons	3098	2 year	1100.00	425.77	432.88		432.91	0.000783	1.89	1455.95	1126.32	0.15
Thompsons	2597	100 year	3060.00	425.03	434.33	431.25	434.37	0.000783	2.33	3631.01	3759.22	0.16
Thompsons	2597	25 year	2400.00	425.03	433.84	430.60	433.89	0.000937	2.42	2678.49	3530.01	0.18
Thompsons	2597	10 year	1980.00	425.03	433.45	429.76	433.51	0.001074	2.47	1951.28	3352.78	0.19
Thompsons	2597	5 year	1630.00	425.03	433.08	429.33	433.15	0.001213	2.51	1381.93	2872.58	0.20
Thompsons	2597	2 year	1110.00	425.03	432.29	428.59	432.36	0.001253	2.35	697.95	1541.91	0.19
Thompsons	2097	100 year	3060.00	423.25	433.85	430.99	433.90	0.000884	2.75	2875.87	3292.59	0.18
Thompsons	2097	25 year	2400.00	423.25	433.30	429.59	433.37	0.000970	2.74	2227.13	3116.49	0.18
Thompsons	2097	10 year	1980.00	423.25	432.86	429.07	432.93	0.001048	2.72	1718.98	2909.21	0.19
Thompsons	2097	5 year	1630.00	423.25	432.42	428.61	432.50	0.001179	2.76	1272.86	2686.87	0.20
Thompsons	2097	2 year	1110.00	423.25	431.50	427.82	431.61	0.001596	2.87	641.31	1628.90	0.22
Thompsons	1600	100 year	3300.00	422.71	432.83	430.71	433.00	0.002801	4.23	1709.72	2359.34	0.30
Thompsons	1600	25 year	2510.00	422.71	432.27	429.97	432.44	0.002922	4.05	1199.77	1034.61	0.31
Thompsons	1600	10 year	2060.00	422.71	431.79	429.03	431.97	0.003004	3.93	907.35	518.24	0.31
Thompsons	1600	5 year	1690.00	422.71	431.32	428.36	431.50	0.003142	3.84	692.39	373.63	0.31
Thompsons	1600	2 year	1120.00	422.71	430.28	427.14	430.48	0.003271	3.71	414.20	203.55	0.31
Thompsons	1098	100 year	3300.00	421.70	430.98	428.61	431.26	0.003669	4.80	1118.76	625.80	0.35
Thompsons	1098	25 year	2510.00	421.70	430.34	427.76	430.62	0.003938	4.60	766.21	445.81	0.35
Thompsons	1098	10 year	2060.00	421.70	429.85	427.31	430.12	0.004085	4.40	590.29	307.91	0.36
Thompsons	1098	5 year	1690.00	421.70	429.34	426.91	429.60	0.004211	4.24	452.93	211.00	0.36
Thompsons	1098	2 year	1120.00	421.70	428.42	426.21	428.63	0.003993	3.68	315.64	115.82	0.34
Thompsons	738	100 year	3420.00	421.76	429.95	426.98	430.11	0.002502	3.29	1168.72	410.77	0.28
Thompsons	738	25 year	2620.00	421.76	429.31	426.51	429.44	0.002503	3.02	932.11	322.80	0.27
Thompsons	738	10 year	2150.00	421.76	428.81	426.17	428.93	0.002502	2.87	788.42	261.77	0.27
Thompsons	738	5 year	1730.00	421.76	428.29	425.79	428.40	0.002502	2.73	662.91	221.89	0.27
Thompsons	738	2 year	1130.00	421.76	427.38	425.10	427.47	0.002500	2.48	476.34	186.29	0.26

HEC-RAS Report for 1997 Design Channel

HEC-RAS Version 3.1.1 May 2003
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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X     X  XXXXXX    XXXX        XXXX      XX     XXXX
X     X  X        X    X       X   X    X  X   X
X     X  X        X            X   X   X    X  X
XXXXXXX  XXXX     X      XXX   XXXX    XXXXXX   XXXX
X     X  X        X            X  X    X    X       X
X     X  X        X    X       X   X   X    X       X
X     X  XXXXXX    XXXX        X    X  X    X  XXXXX
```

PROJECT DATA
Project Title: Prelim. Analysis Thompson's Branch
Project File : TBrPrelim.prj
Run Date and Time: 6/13/2007 8:23:00 AM

Project in English units

PLAN DATA

Plan Title: 1997 Design Channel
Plan File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.p01

Geometry Title: 1997 Design_Updated_1
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g03

Flow Title : Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Plan Summary Information:

Number of:	Cross Sections =	10	Mulitple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Flow Data (cfs)

River	Reach	RS	100 year	25 year	10 year	5 year	2 year
Thompsons	Thompsons	4901	2740	2170	1820	1510	1050
Thompsons	Thompsons	4602	2680	2190	1850	1530	1060
Thompsons	Thompsons	3597	2870	2290	1910	1580	1100
Thompsons	Thompsons	2597	3060	2400	1980	1630	1110

Thompsons	Thompsons	1600	3300	2510	2060	1690
1120						
Thompsons	Thompsons	738	3420	2620	2150	1730
1130						

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Thompsons	Thompsons	100 year		Normal S = 0.0025
Thompsons	Thompsons	25 year		Normal S = 0.0025
Thompsons	Thompsons	10 year		Normal S = 0.0025
Thompsons	Thompsons	5 year		Normal S = 0.0025
Thompsons	Thompsons	2 year		Normal S = 0.0025

GEOMETRY DATA

Geometry Title: 1997 Design_Updated_1
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g03

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4901

INPUT
Description:
Station Elevation Data num= 102

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	444.78	3.03	444.68	9.59	444.46	19.83	444.26	26.09	444.15
36.62	443.85	42.59	443.67	53.08	443.35	58.6	443.11	69.7	442.75
75.1	442.6	86.49	442.32	91.6	442.19	103.28	442.02	108.1	441.95
120.08	441.91	124.61	441.89	136.49	441.83	140.61	441.83	153.15	441.66
157.11	441.63	169.95	441.44	173.61	441.36	186.74	441.06	190.12	440.95
203.53	440.64	206.62	440.56	219.9	440.46	222.62	440.35	236.61	439.89
239.12	439.85	253.4	439.82	255.63	439.82	270.2	439.82	272.13	439.78
286.99	439.65	288.63	439.59	303.32	439.27	304.63	439.28	320.07	439.2
321.14	439.19	336.86	439.08	337.64	439.08	353.65	439.15	354.14	439.15
355.48	439.15	365	441.21	385	437.29	389.51	436.14	392.89	436.14
394	435.77	412	429.77	446	429.77	464	435.77	474	435.77
484.31	435.91	485.14	435.91	500.82	436.04	501.64	436.04	517.34	435.99
518.14	435.99	533.85	436.03	534.64	436.04	549.88	436.11	550.64	436.11
566.37	436.19	567.14	436.2	582.89	436.47	583.64	436.47	599.4	436.77
600.14	436.79	615.91	437.14	616.64	437.16	631.94	438.2	632.64	438.23
648.43	438.84	649.14	438.86	664.95	439.36	665.64	439.39	681.46	440.15
682.14	440.18	697.97	440.73	698.64	440.76	714	441.22	714.64	441.24
730.5	441.78	731.14	441.8	747.01	442.15	747.64	442.18	763.52	442.79
764.14	442.82	780.03	443.48	780.64	443.5	796.06	444.64	796.64	444.66
812.56	446.19	813.14	446.23	829.07	446.25	829.64	446.26	845.58	446.52
846.14	446.54	849.41	446.64						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	394	.04	474	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
394	464	300	299	290	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4602

INPUT
Description:
Station Elevation Data num= 89

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	440.68	3.59	440.73	6.09	440.71	19.59	440.54	22.14	440.49
36.09	439.95	38.61	439.9	52.59	439.67	55.08	439.6	80	439.24
100	435.29	104	435.22	122	429.22	156	429.22	174	435.22
184	435.22	323.47	435.31	327.29	435.39	337.37	435.61	340.07	435.67
341.08	435.7	352.64	436.01	358.15	436.12	365.34	436.38	375.76	436.79
378.16	436.87	384.6	437.22	390.96	437.55	393.37	437.7	403.74	438.03
410.98	438.38	416.51	438.72	428.59	439.21	429.27	439.23	431.12	439.32

441.8	439.82	445.67	439.98	454.54	440.38	463.28	440.7	467.37	440.84
478.35	441.1	480.2	441.14	480.89	441.16	493.02	441.54	498.5	441.61
505.85	441.8	516.11	442.07	518.62	442.17	525.58	442.45	531.14	442.67
533.18	442.76	543.87	443.07	550.79	443.4	556.64	443.52	568.4	443.96
569.41	443.99	572.09	444.09	582.23	444.39	586.01	444.46	595.06	444.33
603.62	444.34	607.79	444.36	619.32	444.49	620.33	444.5	620.7	444.5
633.09	444.76	638.31	444.86	645.87	445.17	655.91	445.47	658.64	445.49
665.84	445.6	671.44	445.67	673.52	445.69	684.26	445.77	691.13	445.9
696.96	445.89	708.21	446.01	709.53	446.03	713.07	446.06	722.36	446.11
725.82	446.13	735.18	446.25	743.43	446.36	748.01	446.38	760.3	446.68
760.84	446.69	761.04	446.7	773.61	446.85	776.69	446.87		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	104	.04	184	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
104	174	517	498	440	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4104

INPUT
Description:
Station Elevation Data num= 283

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.12	6.1	435.47	11.47	434.9	22.73	433.25	27.97	432.44
39.37	431.58	44.47	431.22	55.65	431.57	60.47	431.69	72.13	431.84
76.98	431.93	88.77	431.49	93.48	431.32	105.4	430.85	109.98	430.64
122.04	430.44	126.48	430.41	138.3	430.82	142.48	430.94	154.81	431.24
158.98	431.34	171.44	431.49	175.48	431.61	200.88	431.42	208.48	431.23
220.95	431.04	224.48	431.03	237.48	431.05	240.98	431.05	254.11	431.21
257.48	431.27	270.75	431.72	273.98	431.74	287.38	432.73	290.48	432.82
303.6	431.55	306.48	431.45	320.15	432.1	322.98	432.18	336.78	432.15
339.48	432.18	353.42	431.89	355.98	431.88	370.05	431.79	372.48	431.78
386.25	431.95	388.48	431.95	402.82	432.01	404.99	432.02	419.45	432.09
421.49	432.12	436.09	432.1	437.99	432.07	452.72	432.19	454.49	432.21
468.9	432.22	470.49	432.24	485.49	432.2	486.99	432.19	502.12	431.97
503.49	431.96	518.76	431.97	519.99	431.96	535.39	431.94	536.49	431.94
551.55	431.93	552.49	431.93	568.16	432.07	568.99	432.08	584.79	432.42
585.49	432.43	601.43	432.73	601.99	432.75	618.06	432.93	618.49	432.94
634.2	433.16	634.49	433.17	650.83	433.59	650.99	433.59	667.46	434.16
667.49	434.16	671.36	434.2	683.99	434.31	684.1	434.31	700.49	434.37
700.72	434.37	716.5	434.17	716.86	434.16	733	434.09	733.49	434.09
749.5	434.03	750.12	434.04	766	434.14	766.76	434.13	782.5	433.84
783.36	433.83	798.5	433.75	799.52	433.75	815	433.8	816.15	433.81
831.5	433.96	832.78	433.94	848	433.99	856.81	433.95	946.5	433.14
948.64	433.11	962.5	432.99	964.84	432.99	979	433.02	981.47	433.01
995.5	433	998.1	433.03	1005.03	433.11	1052.01	433.71	1057.95	433.79
1061.01	433.86	1064.13	433.84	1077.51	433.8	1080.76	433.77	1094.01	433.77
1107.04	436.09	1113.92	436.88	1126.51	437.36	1130.16	437.55	1143.01	438.42
1146.79	438.58	1159.51	439.34	1163.42	439.31	1176.01	439.06	1180.06	439.09
1192.51	439.05	1196.56	439.19	1208.51	439.67	1212.82	439.85	1225.01	440.01
1229.45	440.13	1241.51	440.09	1253.38	439.93	1258.01	439.68	1272.1	439.69
1279.2	439.64	1290.51	439.66	1295.48	439.51	1307.01	439.11	1313	438.94
1342.81	433.42	1343	433.36	1358	428.36	1398	428.36	1413	433.36
1423	433.36	1485.81	433.43	1488.5	433.47	1492.72	433.52	1500.44	433.63
1505.31	433.67	1512.41	433.75	1523.68	433.91	1524.37	433.92	1524.81	433.92
1536.34	434.08	1544.3	434.1	1548.3	434.11	1554.65	434.19	1560.23	434.27
1563.8	434.33	1571.97	434.45	1582.71	434.57	1583.66	434.57	1585.15	434.59
1595.62	434.7	1602.21	434.76	1607.58	434.8	1616.12	434.89	1619.53	434.92
1621.71	434.95	1631.42	435.06	1641.2	435.13	1643.31	435.14	1646.62	435.17
1655.26	435.25	1660.7	435.31	1667.1	435.39	1677.58	435.52	1678.84	435.53
1679.61	435.54	1690.79	435.62	1699.11	435.69	1702.76	435.72	1708.55	435.79
1714.68	435.88	1718.61	435.91	1726.58	435.99	1738.1	436.07	1738.47	436.07
1739.05	436.07	1750.43	436.18	1757.6	436.23	1762.31	436.25	1770.02	436.29
1774.02	436.31	1776.51	436.33	1785.87	436.34	1796.01	436.28	1797.77	436.3
1800.52	436.31	1809.71	436.39	1815.51	436.42	1821.68	436.52	1831.48	436.73
1833.64	436.78	1835	436.8	1845.61	436.96	1854.5	437.08	1857.52	437.13
1862.45	437.2	1869.22	437.28	1873.41	437.37	1881.03	437.5	1892.91	437.6
1892.92	437.6	1892.95	437.6	1904.89	437.81	1912.41	437.9	1916.85	437.95
1923.92	438.04	1928.79	438.1	1931.9	438.17	1940.68	438.35	1951.4	438.4
1952.56	438.42	1954.42	438.44	1964.28	438.57	1970.31	438.61	1976.13	438.66
1985.38	438.75	1988.1	438.78	1989.81	438.81	2000.06	438.94	2009.31	439.06
2012.03	439.09	2016.35	439.11	2023.95	439.16	2028.8	439.21	2035.84	439.34
2046.85	439.53	2047.74	439.54	2048.3	439.55	2059.49	439.81	2067.21	439.95
2071.31	439.98	2077.82	440.09	2083.24	440.19	2086.71	440.25	2095.13	440.39
2106.21	440.59	2107.03	440.61	2108.32	440.67	2118.99	441.06	2125.7	441.4

2130.95	441.5	2139.28	441.65	2142.92	441.72	2145.2	441.76	2154.7	441.89
2164.11	442.07	2166.48	442.13	2170.25	442.26	2178.4	442.54	2183.61	442.79
2190.29	443.04	2200.75	443.27	2202.19	443.31	2203.1	443.38	2214.16	444.45
2222.6	445.58	2226.12	445.89	2231.72	446.62	2238.05	447.2	2242.1	447.27
2249.8	447.34	2261.01	447.46	2261.42	447.47				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1343	.04	1423	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1343	1413	650	507	490	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1229.45	440.13	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3597

INPUT
Description:
Station Elevation Data num= 351

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.05	6.13	435.53	12.12	435.04	22.3	432.82	28.63	431.64
38.46	430.65	45.13	429.97	54.63	430.56	61.63	430.86	70.52	431.18
77.64	431.32	86.46	431.25	94.14	431.17	102.63	431.06	110.64	430.97
118.79	431.07	127.15	431.14	134.96	431.24	143.65	431.34	150.9	431.36
159.66	431.37	166.8	431.34	176.16	431.43	182.96	431.43	192.66	431.47
199.13	431.76	209.17	432.03	215.29	432.18	225.67	432.49	231.28	432.62
241.67	432.65	247.13	432.52	258.18	432.53	263.29	432.5	274.68	432.27
279.46	432.21	291.18	432.11	295.62	432.11	307.69	432.07	311.67	432.01
323.69	431.79	327.46	431.74	340.19	431.55	343.63	431.52	356.7	431.34
359.79	431.34	373.2	431.28	375.96	431.27	389.7	431.4	392.05	431.39
405.71	431.35	407.79	431.34	422.21	431.27	423.96	431.24	438.71	431.08
440.12	431.08	455.22	430.89	456.29	430.89	471.72	430.67	472.43	430.67
487.73	430.67	488.13	430.67	504.23	430.52	504.29	430.52	507.26	430.52
520.46	430.51	520.73	430.51	536.63	430.5	537.24	430.5	552.8	430.54
553.74	430.53	568.52	430.43	569.74	430.43	584.65	430.51	586.25	430.52
600.82	430.48	602.75	430.48	616.99	430.53	619.25	430.53	633.16	430.51
635.76	430.51	648.92	430.58	651.76	430.57	665	430.65	668.26	430.66
681.17	430.76	684.77	430.8	697.34	430.91	701.27	430.96	713.51	431.1
717.77	431.17	729.33	431.29	733.78	431.35	745.36	431.41	750.28	431.42
761.53	431.45	766.78	431.46	777.7	431.58	783.29	431.6	793.87	431.7
799.79	431.79	809.73	431.92	815.8	431.96	825.72	432.1	832.3	432.23
841.89	432.37	848.8	432.46	858.06	432.58	865.31	432.68	874.23	432.88
881.81	433.07	890.14	433.34	897.81	433.42	906.08	433.45	914.32	433.5
922.25	433.47	930.82	433.52	1403	433.5	1421	427.5	1455	427.5
1473	433.5	1483	433.5	1502.16	433.84	1503.02	433.83	1504.92	433.79
1519.28	433.9	1521.42	433.92	1535.54	434.54	1537.92	434.63	1551.38	434.57
1553.93	434.56	1567.56	434.18	1570.43	434.09	1583.82	434.09	1586.93	434.1
1600.07	434.36	1603.43	434.44	1616.33	434.54	1619.93	434.57	1632.21	434.35
1635.94	434.33	1648.35	434.39	1651.86	434.41	1652.55	434.42	1661.2	434.64
1672.3	434.73	1673.12	434.72	1674.35	434.72	1684.96	434.67	1692.05	434.66
1696.8	434.57	1703.92	434.42	1708.67	434.31	1711.8	434.25	1720.42	434.25
1730.96	434.29	1732.14	434.31	1733.93	434.32	1743.99	434.39	1750.71	434.53
1755.83	434.63	1763.5	434.73	1767.7	434.8	1770.46	434.85	1779.61	434.84
1790.21	434.78	1791.52	434.77	1793.51	434.76	1803.44	434.71	1809.96	434.67
1815.25	434.76	1823.53	434.87	1826.92	434.92	1829.12	434.93	1838.72	435.02
1848.87	435.12	1850.56	435.1	1853.09	435.07	1862.46	434.95	1868.62	434.9
1874.37	434.83	1883.11	434.71	1886.26	434.67	1888.37	434.65	1898.11	434.61
1908.12	434.55	1909.91	434.55	1912.68	434.57	1921.59	434.61	1927.28	434.65
1933.39	434.72	1942.69	434.81	1945.31	434.83	1947.03	434.85	1957.22	434.88
1966.78	434.9	1969.13	434.91	1972.71	434.9	1981	434.89	1986.53	434.89
1992.84	434.88	2002.27	434.87	2004.69	434.86	2006.28	434.86	2016.41	434.89
2025.44	434.86	2028.16	434.85	2032.29	434.83	2040.02	434.78	2045.19	434.75
2051.86	434.71	2061.85	434.68	2063.71	434.68	2064.94	434.67	2075.63	434.65
2084.69	434.62	2087.54	434.62	2091.87	434.6	2099.45	434.58	2104.44	434.53
2111.24	434.54	2121.89	434.52	2122.92	434.52	2123.59	434.51	2134.75	434.5
2143.35	434.43	2146.59	434.42	2151.45	434.47	2158.48	434.55	2163.1	434.55
2170.39	434.55	2181.47	434.64	2182.3	434.65	2182.85	434.65	2194.14	435.03
2202.6	434.89	2205.91	434.74	2211.03	434.85	2217.58	434.83	2221.75	434.88
2229.41	434.66	2241.05	434.54	2241.32	434.53	2241.5	434.52	2253.24	433.77
2261.26	432.99	2265.15	432.78	2271.07	432.43	2277.03	432.11	2281.01	431.99
2288.87	431.79	2300.63	431.53	2300.71	431.53	2300.76	431.53	2312.4	431.59
2319.91	431.32	2324.17	431.36	2330.65	431.32	2336.05	431.71	2339.66	431.85
2347.89	432.05	2359.42	432.97	2359.73	432.99	2360.21	433.02	2371.64	433.41
2379.17	433.94	2383.56	434.05	2390.23	434.18	2395.47	434.01	2398.92	434.12
2407.23	434.33	2418.07	434.78	2418.93	434.83	2420.25	434.88	2430.78	434.97

2437.82	435.14	2442.62	435.22	2449.81	435.43	2454.49	435.52	2457.57	435.63
2466.41	435.74	2477.33	435.98	2478.32	435.95	2479.83	435.9	2490.17	435.42
2497.08	435.28	2501.92	435.27	2509.39	435.21	2513.57	435.16	2516.23	435.14
2525.43	435.16	2535.98	435.19	2537.34	435.18	2539.41	435.18	2549.26	435.19
2555.73	435.17	2561.17	435.19	2569.43	435.15	2573.06	435.15	2575.49	435.15
2584.9	435.37	2595.24	435.58	2596.71	435.6	2598.99	435.66	2608.39	435.93
2614.39	435.97	2620.19	435.98	2629.01	436.09	2632.09	436.13	2634.14	436.16
2643.93	436.19	2653.89	436.19	2655.77	436.2	2658.57	436.21	2667.66	436.21
2673.65	436.27	2679.57	436.36	2688.59	436.46	2691.49	436.49	2693.4	436.54
2703.21	436.89	2712.55	437.03	2714.95	437.11	2718.6	437.24	2726.81	437.6
2732.3	437.71	2738.66	437.86	2748.17	438.29	2750.51	438.4	2752.05	438.44
2762.42	438.55	2771.8	438.75	2774.34	438.78	2778.18	438.84	2786.2	438.89
2791.56	438.95	2797.92	439.02	2807.75	439.11	2809.56	439.14	2810.71	439.17
2821.45	439.34	2830.46	439.6	2833.36	439.69	2837.77	439.74	2845.27	439.85
2850.21	439.93	2857.19	440.1	2867.78	440.27	2869.09	440.3	2869.96	440.32
2875.28	440.48								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1403	.04	1483	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1403	1473	510	499	584	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1770	2438	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3098

INPUT
Description:
Station Elevation Data num= 420

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.2	1.24	436.13	14.84	434.22	17.24	433.89	31.14	431.7
33.74	431.33	47.51	429.83	50.24	429.45	63.89	430.18	66.74	430.35
80.26	430.92	83.24	431.05	96.23	431.18	99.24	431.22	112.51	430.73
115.74	430.64	128.88	430.51	132.24	430.46	145.26	430.79	148.74	430.87
165.24	431.1	177.62	431.14	181.24	431.14	193.88	431.19	197.74	431.2
210.25	431.27	226.63	431.39	230.74	431.43	243	431.49	247.24	431.56
259.01	431.53	263.24	431.51	275.25	431.39	279.74	431.31	291.62	431.34
308	431.42	312.74	431.43	324.37	431.36	329.24	431.34	345.25	431.24
372.99	430.99	378.25	430.92	394.75	431.01	405.74	431.14	411.25	431.23
421.79	431.33	427.25	431.35	437.99	431.34	443.75	431.37	454.36	431.51
460.25	431.56	487.11	431.54	493.25	431.52	503.17	431.64	509.25	431.74
525.75	431.76	542.25	431.89	552.11	431.88	558.75	431.91	568.48	431.99
575.25	432.07	584.56	432.12	591.25	432.17	607.75	432.02	617.1	432.05
624.25	432.03	640.75	432.15	657.25	432.14	665.95	432.11	673.26	432.11
682.1	432.09	689.76	432.05	698.47	432.17	706.26	432.31	714.85	432.39
722.76	432.41	739.26	432.4	755.26	432.36	771.76	432.49	779.84	432.5
788.26	432.49	796.22	432.56	804.76	432.57	812.59	432.65	821.26	432.83
837.26	432.7	844.84	432.66	853.76	432.54	861.21	432.48	870.26	432.53
886.76	432.45	893.96	432.45	903.26	432.4	910.12	432.46	919.26	432.52
926.21	432.55	942.58	432.52	952.26	432.54	958.96	432.53	975.33	432.44
985.26	432.43	991.51	432.46	1001.27	432.47	1007.58	432.52	1017.77	432.56
1023.95	432.56	1040.33	432.63	1050.77	432.76	1056.66	432.94	1059.61	433.39
1072.96	434.33	1080.36	434.32	1102.72	435.18	1109.42	435.54	1137.67	435.54
1143.71	435.47	1238.36	434.69	1261.77	434.41	1391	433.5	1411.58	426.64
1440.42	426.64	1461	433.5	1471	433.5	1477.28	433.77	1481.4	433.77
1491.62	433.83	1493.44	433.85	1496.12	433.83	1508.59	433.63	1521.06	433.5
1529.67	433.53	1533.52	433.64	1545.97	433.82	1547.79	433.85	1565.9	434.01
1581.38	433.82	1582.83	433.8	1583.47	433.79	1595.28	433.72	1601.59	433.67
1607.75	433.78	1619.7	433.95	1620.21	433.95	1637.82	434.12	1645.03	434.1
1655.93	434.11	1660.71	434.08	1669.6	434.01	1673.5	433.97	1691.62	434.33
1706.91	434.28	1709.73	434.3	1727.85	433.99	1731.84	434.01	1740.64	433.89
1744.29	433.88	1745.96	433.86	1756.47	434.13	1763.53	434.13	1768.72	434.23
1780.01	434.69	1781.14	434.73	1781.65	434.74	1793.6	434.85	1799.76	434.98
1806.07	434.94	1830.95	434.91	1835.99	434.93	1843.2	434.93	1853.56	434.97
1855.38	434.97	1859.34	434.95	1867.83	434.88	1871.68	434.88	1892.76	434.8
1899.31	434.84	1905.22	434.86	1907.91	434.86	1917.69	434.91	1926.02	435.01
1930.07	435.03	1939.27	435.05	1954.64	435.06	1961.71	435.04	1967.04	435.07
1979.82	435.07	1991.92	435.03	1997.94	435.06	2004.38	435.06	2016.05	434.89
2016.83	434.89	2018.6	434.9	2033.62	435.02	2041.29	434.96	2051.74	434.84
2066.15	434.7	2078.61	434.5	2087.97	434.32	2091.08	434.28	2097.94	434.25
2103.54	434.21	2106.08	434.21	2115.8	434.27	2123.65	434.28	2128.1	434.35
2140.55	434.49	2141.77	434.51	2152.96	434.65	2159.88	434.68	2177.27	434.84
2177.77	434.85	2178	434.85	2196.11	435.05	2202.56	435.09	2213.68	435.13
2227.21	435.12	2231.8	434.94	2239.61	434.9	2249.91	435.05	2252.02	435.04

2264.46	435.59	2268.03	435.65	2286.14	435.6	2289.33	435.56	2296.56	435.52
2301.53	435.46	2303.71	435.46	2313.95	435.42	2321.83	435.49	2326.41	435.5
2338.87	435.33	2339.94	435.33	2351.27	435.4	2358.06	435.37	2363.68	435.44
2375.9	435.51	2376.17	435.51	2388.29	435.55	2393.74	435.58	2411.86	435.44
2413.11	435.41	2415.86	435.37	2429.97	435.11	2437.93	435.05	2448.09	435.15
2450.34	435.16	2455.23	435.17	2466.2	435.21	2487.33	435.38	2512.26	435.47
2520	435.44	2524.73	435.43	2535.16	435.35	2537.19	435.34	2538.12	435.34
2549.59	435.5	2556.23	435.62	2573.8	435.73	2574.03	435.73	2574.52	435.72
2586.49	435.61	2591.92	435.58	2598.96	435.6	2614.49	435.6	2623.84	435.58
2628.15	435.62	2636.25	435.81	2646.26	435.91	2648.61	435.9	2653.85	435.96
2660.78	436.02	2663.83	436.06	2673.18	436.04	2681.95	435.98	2685.65	435.97
2698.12	435.9	2700.06	435.88	2710.58	435.85	2718.18	435.85	2723.05	435.81
2733.79	435.76	2735.5	435.75	2736.29	435.74	2747.67	435.54	2753.86	435.48
2759.94	435.38	2771.98	435.29	2773.15	435.29	2784.81	435.18	2797.27	435.04
2808.21	434.89	2809.74	434.88	2813.12	434.89	2826.32	434.9	2834.4	434.93
2843.89	434.94	2846.6	434.93	2852.48	434.96	2859.04	434.98	2862.01	434.97
2871.5	434.96	2880.12	434.98	2892.45	435.04	2896.43	435.05	2898.24	435.07
2916.35	434.77	2921.26	434.68	2932.42	434.52	2933.46	434.51	2933.92	434.5
2952.04	434.55	2958.26	434.65	2970.15	434.77	2970.67	434.78	2971.78	434.79
2983.13	434.92	2988.27	434.96	3006.38	435.2	3008.02	435.23	3020.19	435.49
3023.95	435.6	3032.51	435.77	3042.07	436	3057.35	436.25	3060.18	436.29
3069.82	436.4	3078.3	436.52	3082.28	436.55	3094.75	436.71	3096.41	436.72
3106.99	436.82	3113.98	436.87	3119.3	436.95	3131.05	437.16	3131.77	437.17
3132.1	437.17	3144.17	437.48	3156.58	437.82	3168.98	438.19	3170.41	438.23
3181.44	438.58	3186.44	438.69	3204.01	438.93	3206	438.94	3218.42	439.05
3222.13	439.04	3230.83	438.94	3240.24	438.92	3243.24	438.88	3255.67	438.66
3258.36	438.62	3268.14	438.74	3276.47	438.63	3280.52	438.6	3292.72	438.53
3294.04	438.5	3305.16	438.37	3317.62	438.27	3329.68	438.43	3330.09	438.44
3330.27	438.44	3342.49	438.29	3348.39	438.29	3354.9	438.2	3366.5	438.23
3367.29	438.22	3369.04	438.21	3379.48	438.13	3384.07	438.13	3391.85	438.2
3402.19	438.16	3404.31	438.16	3409.01	438.05	3416.74	437.93	3420.3	437.54
3429.15	436.75	3438.42	436.43	3441.55	436.19	3448.37	436.12	3453.99	436.01
3456.53	435.89	3466.25	435.51	3474.1	435.3	3478.54	435.31	3488.34	435.44
3491.01	435.47	3492.22	435.49	3503.47	435.78	3510.33	435.97	3528.31	436.64
3528.45	436.65	3546.56	437.43	3553.08	437.7	3564.13	438.28	3565.25	438.32
3577.7	438.98	3582.25	439.5	3590.17	440.53	3600.36	442.08	3602.63	442.5
3607.64	443.56	3615.06	445.11	3618.48	446.45	3627.47	450.49	3636.59	453.78
3639.81	454.45	3647	456.64	3651.97	458.03	3654.16	458.45	3664.39	460.21
3672.28	461.27	3676.86	462	3686.97	464.12	3689.32	464.59	3689.76	464.7
3694.09	466.39	3696.83	466.8	3697.34	466.76	3697.71	466.72	3698.35	466.71

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1391	.04	1481.4	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1391	1461	690	501	980	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2597

INPUT
Description:
Station Elevation Data num= 466

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.14	14.23	434.39	20.54	433.81	40.1	432.6	41.54	432.48
46.53	432.01	62.22	430.48	66.77	430.13	83.22	430.09	93.45	430.04
103.9	430.21	120.12	430.24	124.9	430.22	145.9	430.39	146.8	430.4
166.58	430.56	172.66	430.62	187.58	430.95	191.94	431.07	196.52	431.22
200.27	431.29	213.03	431.64	217.35	431.7	229.54	431.98	234.43	432.1
246.05	432.16	251.33	432.15	262.05	432.25	268.06	432.32	278.56	432.34
295.07	432.13	302.22	432.09	311.58	432.22	319.29	432.26	328.09	432.17
336.11	432.21	352.93	432.19	360.61	432.2	377.12	432.35	404.16	432.44
410.13	432.41	420.89	432.54	426.14	432.53	437.8	432.46	442.65	432.49
454.88	432.4	471.95	432.36	475.67	432.38	489.03	432.4	492.18	432.4
505.67	432.54	508.19	432.55	522.67	432.59	524.69	432.6	539.74	432.79
541.2	432.8	556.82	433.16	557.71	433.17	573.9	433.06	574.22	433.06
590.23	433.21	590.45	433.21	606.74	433.52	607.52	433.52	623.25	433.44
624.59	433.45	639.76	433.3	641.66	433.32	656.27	433.55	658.65	433.55
672.27	433.68	675.28	433.65	688.78	433.38	709.41	433.26	721.8	433.37
726.48	433.36	743.39	433.22	754.32	433.11	760.1	433.13	770.83	433.15
777.17	433.14	787.34	433.18	794.24	433.18	803.84	433.26	811.3	433.23
836.36	433.07	844.92	432.99	852.87	432.94	869.38	432.77	879.06	432.77
885.89	432.74	896.13	432.79	902.4	432.7	912.86	432.85	918.41	433.03
929.75	432.99	934.91	432.98	946.81	432.93	951.42	432.96	963.88	432.89
980.95	432.72	984.44	432.7	997.59	432.65	1000.45	432.65	1014.57	432.73
1016.96	432.72	1031.64	432.6	1048.71	432.5	1049.98	432.49	1065.77	432.58
1066.49	432.58	1082.33	432.7	1082.49	432.71	1099	432.64	1099.39	432.64

1115.51	432.46	1116.46	432.47	1132.02	432.76	1133.53	432.77	1148.53	432.85
1150.53	432.85	1164.54	432.87	1167.15	432.91	1181.05	433.01	1184.22	433.05
1197.56	433.42	1230.57	433.74	1246.58	433.93	1251.97	433.97	1263.09	434.1
1269.04	434.21	1279.6	434.32	1286.11	434.2	1296.11	434.13	1303.18	433.99
1312.62	433.9	1328.63	433.95	1345.14	434.16	1353.86	434.38	1370.93	434.51
1378.15	434.58	1388	434.48	1394.66	434.39	1404.74	434.4	1410.67	434.47
1421.62	433.65	1434	433.09	1450	432.3	1469.56	425.78	1500.44	425.78
1520	432.3	1530	432.3	1533	432.48	1542.23	432.61	1557.18	432.77
1558.74	432.79	1573.54	432.65	1574.74	432.64	1590.23	432.57	1591.24	432.56
1606.95	432.63	1607.74	432.63	1623.67	432.72	1624.24	432.72	1640.39	432.83
1640.74	432.83	1656.62	432.85	1673.25	432.83	1673.34	432.83	1689.75	432.9
1690.06	432.9	1706.25	432.95	1706.79	432.95	1722.75	432.82	1723.49	432.82
1738.75	432.8	1739.73	432.79	1755.25	432.7	1756.46	432.7	1771.76	432.6
1773.19	432.57	1788.26	432.49	1795.72	432.49	1800.41	432.5	1804.02	432.5
1805.42	432.51	1816.51	432.57	1829.11	432.67	1841.85	432.74	1845.82	432.77
1854.59	432.86	1858.02	432.86	1875.73	432.94	1880.08	432.99	1891.22	433.1
1892.81	433.12	1893.44	433.12	1905.23	433.26	1910.61	433.3	1917.8	433.33
1928.32	433.31	1930.48	433.3	1943.2	433.3	1955.94	433.44	1963.75	433.46
1981.34	433.3	1981.46	433.3	1993.83	433.24	2016.34	433.36	2019.1	433.36
2026.05	433.57	2031.81	433.68	2034.05	433.74	2044.55	433.95	2051.76	434.13
2057.29	434.18	2069.48	434.31	2070.02	434.29	2071.46	434.24	2082.48	433.77
2086.65	433.63	2095.13	433.46	2104.36	433.07	2107.87	432.98	2120.59	432.97
2122.07	432.96	2123.93	432.9	2125.4	432.88	2168.32	431.7	2181.53	431.68
2197.44	431.53	2246.91	431.46	2297.1	431.03	2297.82	431.01	2298.11	431.01
2310.56	431.12	2315.82	431.18	2323.31	431.12	2333.53	431.18	2335.99	431.16
2342.5	431.21	2348.43	431.22	2350.7	431.21	2361.06	431.14	2373.75	431.15
2386.12	431.12	2387.22	431.12	2399.17	431.08	2403.84	431.01	2411.91	430.99
2421.55	431.1	2424.59	431.11	2432.62	431.25	2437.03	431.32	2438.72	431.3
2449.68	431.71	2456.43	431.73	2462.26	431.67	2487.78	430.84	2491.85	430.94
2500.52	431.03	2509.56	430.99	2513.18	430.95	2522.74	430.8	2525.64	430.76
2526.74	430.75	2538.36	430.5	2544.45	430.45	2562.16	430.4	2563.84	430.4
2568.14	430.42	2576.54	430.43	2589.23	430.58	2601.82	430.63	2614.76	430.62
2626.96	430.68	2632.47	430.77	2639.71	430.84	2650.18	430.92	2652.45	430.95
2658.26	431.07	2665.16	431.18	2667.89	431.21	2677.84	431.27	2685.6	431.34
2690.42	431.37	2702.77	431.56	2702.98	431.56	2728.31	431.68	2748.38	431.62
2755.91	431.62	2773.62	431.65	2779.15	431.67	2790.79	431.68	2791.63	431.69
2793.78	431.7	2808.5	431.82	2817.01	431.87	2826.21	431.88	2829.7	431.89
2842.4	431.86	2843.92	431.87	2861.64	431.93	2867.75	431.99	2880.24	432.25
2892.94	432.4	2896.52	432.45	2918.31	432.49	2928.62	432.56	2931.01	432.58
2931.94	432.59	2943.75	432.67	2966.83	432.75	2968.85	432.79	2974.02	432.84
2981.59	432.95	2984.54	432.95	2994.33	432.97	3002.25	432.96	3007.07	432.99
3019.43	432.94	3019.96	432.94	3032.5	432.91	3037.67	432.91	3045.02	432.69
3054.85	432.45	3057.48	432.39	3064.14	432.19	3070.2	432.03	3078.01	431.98
3096.66	432.03	3106.98	432.18	3107.98	432.19	3121.11	432.19	3125.69	432.07
3133.62	431.92	3142.86	431.98	3146.1	432.06	3154.26	431.96	3158.8	431.92
3160.57	431.93	3171.54	431.96	3178.29	432.09	3184.28	431.96	3196	431.8
3199.66	431.69	3209.77	431.41	3213.71	431.33	3222.31	431.27	3230.88	430.99
3234.86	431.02	3245.07	431	3247.59	431.02	3248.59	431	3260.28	431.35
3266.3	431.33	3272.96	431.35	3284.01	431.64	3285.65	431.68	3289.78	431.81
3298.37	432.02	3301.72	432.12	3310.91	432.12	3318.9	432.24	3323.47	432.22
3335.19	432.31	3336.21	432.32	3337.54	432.32	3372.03	432.35	3374.26	432.34
3379.9	432.3	3386.98	432.23	3389.74	432.22	3399.5	432.15	3406.92	432.12
3412.08	432.08	3424.63	431.93	3424.82	431.93	3425.3	431.92	3442.34	431.81
3450.3	431.78	3460.05	431.77	3463.04	431.76	3488.21	432.14	3494.93	432.25
3500.75	432.27	3512.64	432.24	3513.43	432.24	3515.42	432.27	3526.16	432.39
3530.35	432.46	3538.91	432.64	3548.07	432.73	3556.99	432.78	3560.83	432.81
3638.52	433.16	3640.25	433.16	3650.94	433.18	3652.99	433.19	3665.47	433.19
3670.97	433.22	3688.68	433.2	3690.83	433.21	3703.54	433.38	3706.39	433.43
3716.23	433.67	3724.1	433.79	3741.06	434.01	3741.81	434.01	3758.99	434.14
3766.7	434.17	3776.7	434.3	3786.47	434.48	3792.16	434.56	3794.41	434.57
3804.84	434.72	3812.12	434.67	3817.53	434.57	3830.21	434.56	3831.18	434.57
3842.66	434.63	3855.31	434.71	3864.71	434.74	3868.05	434.71	3876.59	434.41
3880.79	434.29	3882.43	434.19	3893.53	433.42	3900.14	432.95	3906.27	432.72
3917.85	432.66	3918.98	432.71	3921.99	432.99	3931.41	433.94	3935.02	434.24
3944.01	434.97	3952.73	435.27	3956.7	435.38	3966.71	436.05	3969.39	436.2
3970.44	436.29	3982.14	436.81	3988.15	437.36	3994.88	438.09	4005.87	439.54
4007.58	439.88	4012.11	440.56	4020.01	441.91	4023.04	442.56	4032.62	444.75
4040.75	446.25	4045.31	446.94	4056.82	448.58	4058	448.75	4058.46	448.81
4076.17	453.01	4093.88	455.59	4096.17	456	4111.06	458.83	4121.32	460.43
4128.77	461.29	4134.06	462.15	4146.48	463.12	4146.8	463.16	4147.63	463.04
4154.29	461.97								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1450	.04	1530	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1450	1520	760	500	410	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2069	3842	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2097

INPUT
Description:
Station Elevation Data num= 438

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.08	8.65	435.23	17.96	434.13	25.15	432.93	34.18	431.92
41.65	430.74	50.14	430.13	57.66	429.98	66.13	430.05	74.16	430.38
82.36	430.39	90.66	430.57	123.67	430.48	130.81	430.64	139.67	431.04
146.76	431.27	156.17	431.65	162.98	431.74	172.67	431.83	179.2	432.02
189.18	432.13	195.43	432.42	205.68	432.92	211.47	433.17	221.68	433.58
238.18	433.96	243.6	434.03	254.68	434.11	266.15	434.14	276.05	434.37
287.69	434.39	292.14	434.24	303.69	434.21	308.01	434.18	320.19	434.23
324.23	434.21	336.7	434.17	340.45	434.18	353.2	434.24	356.68	434.24
372.8	434.13	385.7	434.12	388.63	434.1	402.21	434.06	421.08	434.19
437.3	434.29	451.71	434.4	453.47	434.4	484.22	434.59	517.92	434.59
533.72	434.65	549.73	434.67	599.23	434.65	630.56	434.71	648.24	434.71
664.74	434.93	679.2	435.01	681.25	435.03	695.43	434.85	697.75	434.83
713.75	434.55	727.39	434.58	730.25	434.57	746.76	434.62	763.26	434.55
776.08	434.43	779.76	434.41	791.93	434.37	795.76	434.35	812.26	434.34
824.27	434.48	828.77	434.54	840.49	434.6	845.27	434.64	861.77	434.69
872.62	434.68	877.77	434.65	888.68	434.67	921.14	434.62	927.28	434.63
937.37	434.58	953.3	434.32	959.79	434.26	969.33	434.23	976.29	434.19
985.56	434.17	992.79	434.13	1009.29	433.83	1018.01	433.69	1033.99	433.51
1041.8	433.52	1049.97	433.5	1074.8	433.18	1082.43	433.2	1091.3	433.18
1107.81	433.26	1114.67	433.27	1123.81	433.23	1130.62	433.24	1140.31	433.17
1146.85	433.14	1156.81	433.02	1163.07	432.99	1173.32	433.06	1179.3	433.13
1189.82	433.29	1195.36	433.36	1205.82	433.52	1211.26	433.57	1222.32	433.69
1227.49	433.76	1238.83	433.94	1243.72	433.97	1255.33	434.09	1259.95	434.09
1276.04	434.05	1287.83	434.08	1291.91	434.14	1304.34	434.28	1320.84	434.37
1324.36	434.36	1337.34	434.22	1340.59	434.15	1353.84	433.72	1369.84	433.17
1372.55	433.11	1386.35	432.92	1405.01	432.82	1419.35	432.78	1421.23	432.73
1437.41	432.24	1490	432	1511.24	424.92	1538.76	424.92	1560	432
1570	432	1577.51	432.04	1578.18	432.09	1602.8	432.42	1614.27	432.5
1617.74	432.51	1631.67	432.5	1640.07	432.41	1652.64	432.45	1665.24	432.41
1678.22	432.41	1684.85	432.37	1691.2	432.36	1702.25	432.42	1704.14	432.42
1719.13	432.6	1729.83	432.71	1736.53	432.64	1742.86	432.52	1753.94	432.33
1755.89	432.31	1761.69	432.33	1768.92	432.34	1771.34	432.33	1781.95	432.23
1788.75	432.23	1794.84	432.26	1805.63	432.27	1823.03	432.1	1833.6	432.04
1840.44	431.96	1846.58	431.92	1857.84	431.96	1864.6	432.05	1875.25	432.24
1885.36	432.29	1892.12	432.24	1898.24	432.25	1909.53	432.32	1911.27	432.41
1916.45	432.49	1926.93	432.71	1937.25	433.05	1944.34	433.1	1950.23	432.9
1961.74	432.76	1967.51	432.65	1975.89	432.47	1978.62	432.46	1988.86	432.46
1996.03	432.4	2001.89	432.4	2013.43	432.38	2027.95	432.17	2030.83	432.15
2040.98	432.28	2048.24	432.31	2053.88	432.27	2065.12	432.26	2071.2	432.21
2079.64	432.12	2082.52	432.12	2092.62	432	2099.93	431.85	2105.6	431.66
2117.33	431.08	2118.59	431.06	2131.6	431.09	2134.74	431.09	2151.61	431.22
2157.27	431.3	2169.02	431.39	2170.3	431.41	2183.29	431.48	2203.83	431.48
2209.26	431.44	2221.23	431.39	2234.93	431.35	2238.11	431.35	2272.92	431.29
2290.33	431.24	2300.01	431.24	2307.73	431.2	2312.92	431.19	2324.61	431.24
2338.67	431.14	2351.65	431.08	2359.42	431.02	2364.63	431.01	2376.82	431.03
2390.63	431.11	2403.45	431.27	2416.3	431.32	2429.33	431.4	2442.32	431.3
2445.92	431.29	2463.32	431.27	2468.28	431.29	2481.25	431.28	2493.98	431.32
2497.6	431.38	2506.92	431.46	2532.41	431.58	2532.98	431.59	2546.01	431.6
2549.82	431.61	2559.04	431.67	2567.22	431.68	2584.1	431.75	2597.7	431.75
2601.5	431.71	2610.68	431.46	2636.31	431.28	2649.67	431.26	2653.72	431.29
2661.5	431.41	2685.2	431.52	2688.36	431.56	2701.35	431.89	2705.41	431.85
2714.33	431.71	2722.81	431.83	2727.31	431.82	2740.5	431.91	2765.95	431.73
2774.5	431.71	2791.68	431.79	2805.05	431.87	2817.88	431.75	2826.71	431.75
2831.01	431.74	2844.19	431.84	2861	431.92	2869.7	431.73	2895.81	431.69
2908.7	431.86	2913.21	431.93	2934.36	432.32	2947.1	432.44	2964.9	432.41
2973.35	432.38	2982.3	432.33	2999.71	432.13	3002.73	432.13	3025.99	432.1
3040.42	432.02	3050.01	432.11	3051.4	432.11	3064.08	431.77	3068.8	431.82
3077.11	431.96	3086.21	431.95	3101.85	432.01	3115.75	431.97	3120.49	432.02
3137.89	432.05	3152.91	430.66	3155.3	430.43	3172.7	430.43	3180.58	430.69
3189.58	430.88	3193.4	430.93	3206.99	431.26	3219.4	431.52	3224.39	431.57
3232.38	431.58	3245.36	431.53	3258.35	431.54	3259.2	431.53	3271.1	431.5
3276.08	431.48	3284.02	431.39	3307.67	431.48	3310.89	431.48	3323.11	431.45
3336.14	431.39	3345.7	431.28	3349.09	431.25	3359.52	431.3	3364.16	431.28
3379.98	431.17	3397.38	430.98	3400.74	430.92	3410.58	430.82	3414.79	430.8
3426.76	430.72	3432.19	430.6	3439.62	430.53	3449.07	430.59	3452.43	430.69
3462.42	430.63	3466.48	430.66	3478.43	430.83	3483.88	430.87	3504.39	431.13
3517.38	431.23	3518.69	431.26	3530.15	431.4	3535.57	431.45	3543.05	431.38
3552.97	431.33	3556.08	431.33	3565.33	431.26	3570.38	431.24	3587.78	431.26
3595.17	431.23	3605.19	431.23	3608.13	431.26	3620.85	431.3	3633.8	431.28
3639.47	431.35	3646.78	431.46	3656.88	431.47	3659.77	431.49	3674.28	431.5

3685.79	431.44	3698.66	431.31	3720.09	431.29	3725.97	431.3	3737.45	431.38
3743.37	431.38	3750.43	431.42	3760.78	431.43	3763.41	431.42	3776.41	431.48
3789.19	431.32	3812.46	431.12	3815.11	431.12	3847.27	431.25	3864.68	431.22
3879.89	431.14	3892.83	431.14	3898.96	431.2	3905.81	431.22	3918.79	431.23
3931.79	431.13	3933.77	431.1	3944.82	431.11	3951.18	431.14	3957.7	431.14
3968.05	431.18	3970.49	431.17	3983.5	431.16	3985.46	431.14	4020.27	431.04
4035.45	430.99	4037.67	430.97	4048.23	430.8	4061.11	430.73	4071.96	430.64
4074.14	430.63	4087.17	430.52	4089.36	430.48	4100.2	430.23	4106.77	430.2
4113.23	430.07	4124.17	430.96	4126.22	431.15	4132.5	431.34	4138.93	431.56
4141.05	431.73	4151.86	432.87	4158.45	433.11	4164.84	433.31	4177.82	433.54
4183.56	433.59	4193.26	433.69	4203.86	433.84	4210.67	433.96	4216.74	434.09
4229.52	434.39	4242.52	434.61	4244.95	434.69	4255.51	435.1	4262.35	435.52
4276.29	436.85	4279.76	437.1	4281.47	437.32	4286.47	438.22	4294.48	439.63
4297.16	440.18	4307.27	443	4314.04	444.8	4320.14	446.35	4331.45	449.13
4333.17	449.47	4346.2	452.36	4348.85	453.01	4359.23	455.1	4366.26	456.5
4372.27	457.89	4383.66	461	4385.26	461.53	4390.16	462.71	4397.96	464.72
4400.54	465.02	4410.88	465.76	4417.94	465.67	4423.86	465.02	4435.35	463.54
4436.84	463.33	4443.7	462.73	4444.4	462.77				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1490	.04	1570	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1490	1560	460	497	900	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
280	1320	436	F
1944	3775	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1600

INPUT
Description:
Station Elevation Data num= 393

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.32	2.04	436.18	18.54	433.35	26.39	431.64	35.04	429.99
51.54	427.75	59.58	428.01	68.04	428.15	75.93	428.7	84.04	429.35
92.27	429.5	100.54	429.61	117.04	429.58	133.54	429.8	142.06	430.15
150.04	430.41	158.39	431.02	166.04	431.61	174.75	432.16	182.54	432.52
191.35	432.77	199.04	433.2	215.54	433.45	224.54	433.45	240.86	433.63
248.04	433.66	257.23	433.62	264.54	433.72	273.83	433.74	281.04	433.7
290.43	433.72	297.54	433.8	307.02	433.81	323.33	433.76	330.04	433.78
339.71	433.88	346.54	433.87	356.31	433.76	363.04	433.72	372.91	433.72
379.54	433.69	389.5	433.67	396.04	433.6	405.79	433.55	412.04	433.57
428.54	433.36	438.79	433.2	445.04	433.08	455.39	433.08	461.54	433.05
471.99	432.89	478.04	432.82	494.04	432.58	510.54	432.5	521.27	432.54
527.04	432.61	543.55	433.17	554.47	433.26	560.05	433.28	570.73	433.43
576.05	433.54	587.16	433.46	592.55	433.36	609.05	433.23	620.35	433.02
625.55	432.88	636.95	432.73	653.19	432.65	658.05	432.64	669.64	432.53
686.24	432.28	691.05	432.19	702.83	432.1	707.55	432.11	719.43	432.35
724.05	432.42	735.66	432.71	740.05	432.78	752.12	432.88	756.55	432.9
773.05	433.03	785.31	433.1	789.55	433.16	806.05	433.36	822.05	433.52
834.6	433.66	838.55	433.69	855.05	433.72	871.55	433.51	888.05	432.95
900.6	432.46	904.05	432.34	917.08	432.38	920.55	432.38	933.68	432.8
937.05	432.89	953.55	433.06	970.05	433.14	983.06	433.35	986.05	433.38
1002.55	433.62	1016.16	433.97	1019.05	434.02	1032.76	434.17	1035.55	434.22
1052.05	434.37	1068.05	434.41	1082.05	434.62	1101.05	434.99	1117.55	435.43
1131.84	435.66	1150.06	436.07	1166.56	436.22	1181.12	436.32	1183.06	436.35
1197.72	436.44	1214.32	436.56	1232.06	436.65	1249.82	436.68	1257.04	436.66
1270.87	436.66	1281.44	436.59	1287.05	436.57	1293.61	436.5	1305.99	436.44
1317.75	436.31	1323.71	436.28	1329.86	436.2	1341.65	436.16	1354.32	435.7
1360.93	435.39	1366.55	435.1	1379.54	434.22	1390.94	433.83	1398.16	433.57
1403	433.31	1412.43	432.97	1414.94	432.92	1427.14	433.02	1434.82	432.96
1439.37	432.86	1453.43	432.93	1604	432.7	1629.92	424.06	1648.08	424.06
1674	432.7	1684	432.7	2138.22	434.15	2155.87	434.61	2164.19	434.84
2173.53	435.08	2184.72	435.13	2188.83	435.26	2216.38	432.37	2263.44	432.45
2282.5	432.42	2293.34	432.43	2313.71	432.41	2331.37	432.25	2349.02	432.25
2366.15	432.02	2417.61	432.46	2419.12	432.48	2436.77	432.48	2459.36	431.97
2468.19	431.69	2471.55	431.69	2489.21	431.99	2493.76	432.04	2505.72	431.99
2506.86	432	2519.33	432.57	2524.52	432.52	2531.95	432.48	2541.64	432.52
2544.52	432.44	2552.07	432.4	2557.28	432.35	2570.01	432.33	2576.95	432.29
2594.61	432.45	2608.26	432.61	2620.85	432.63	2633.44	432.61	2647.04	432.67
2658.95	432.55	2671.68	432.55	2684.41	432.59	2697.18	432.54	2700.01	432.54
2709.74	432.49	2717.13	432.49	2722.36	432.45	2734.79	432.49	2760.72	432.46
2773.51	432.51	2787.76	432.5	2798.76	432.45	2811.36	432.45	2822.54	432.4
2836.86	432.37	2849.65	432.42	2862.43	432.45	2875.51	432.58	2887.67	432.61

2910.28	432.49	2920.11	432.4	2925.78	432.32	2927.94	432.32	2938.57	432.24
2951.35	432.2	2966.47	432.14	2976.62	432.08	2980.37	432.08	2998.03	432.14
3012.83	432.36	3027.62	432.64	3033.34	432.78	3046.78	432.62	3071.06	432.29
3103.1	432.6	3104.84	432.59	3118.47	432.26	3153.01	433.5	3154.4	433.61
3155.87	433.5	3169.84	433.33	3173.52	433.27	3187.7	432.66	3191.18	432.48
3196.85	432.51	3205.53	432.64	3208.84	432.64	3218.32	432.7	3226.49	432.77
3256.23	432.79	3261.27	432.85	3268.96	432.74	3278.93	432.77	3288.86	432.76
3294.45	432.73	3296.58	432.64	3307.24	432.53	3314.24	432.57	3319.9	432.49
3331.36	432.46	3335.21	432.47	3345.17	432.57	3349.02	432.55	3357.9	432.64
3370.63	432.66	3384.33	432.83	3396.16	432.86	3408.79	432.96	3419.11	433.96
3421.35	433.99	3427.22	435.43	3434.13	436.92	3436.76	436.92	3439.03	436.43
3442.71	436.27	3485.01	433.43	3492.47	433.07	3506.85	433.07	3524.51	432.99
3535.84	433.06	3542.17	433.03	3559.82	433.09	3565.59	432.99	3577.48	432.7
3586.69	432.51	3594.6	432.48	3599.24	432.54	3611.24	432.66	3629.91	433.02
3647.57	433.2	3650.34	433.25	3663.12	433.36	3675.67	433.34	3682.35	433.31
3688.31	433.31	3700	433.38	3717.66	433.44	3735.32	433.47	3739.3	433.5
3752.97	433.54	3764.57	433.5	3770.09	433.54	3777.23	433.55	3790.02	433.43
3795.96	433.43	3805.41	433.39	3823.06	433.33	3828.24	433.39	3841.62	433.35
3853.46	433.41	3857.84	433.41	3875.5	433.24	3887.97	433.26	3904.51	433.3
3917.3	433.38	3928.47	433.4	3934.33	433.35	3945.59	433.22	3955.18	433.03
3963.24	432.94	3980.9	432.88	3993.43	432.93	4006.22	433.03	4026.34	433.1
4031.43	433.11	4044.11	433.22	4056.85	433.25	4068.65	433.24	4082.35	433.14
4086.3	433.13	4103.96	433.24	4121.08	433.3	4133.11	433.31	4158.68	433.12
4171.44	433.08	4174.05	433.06	4184.17	433.1	4191.71	433.16	4196.79	433.22
4208.83	433.33	4222.03	433.4	4226.48	433.38	4234.82	433.44	4247.61	433.38
4261.79	433.35	4273.11	433.18	4279.45	433.12	4285.7	433.14	4296.57	433.13
4302.37	433.15	4314.23	433.16	4323.74	433.02	4348.72	433.08	4362.1	433.07
4367.2	433.04	4387.29	433.05	4401.98	433	4419.63	432.73	4425.52	432.66
4440.73	432.57	4451.02	432.48	4454.94	432.48	4463.61	432.4	4472.07	432.16
4476.21	431.99	4487.09	431.7	4488.99	431.61	4501.72	430.51	4507.38	429.85
4514.45	428.93	4525.04	429.42	4527.19	429.43	4532.74	430.12	4539.95	430.88
4552.51	432.9	4559.81	433.66	4565.13	434.42	4577.47	435.03	4590.71	435.43
4603.49	435.85	4612.78	436.06	4616.28	436.12	4630.44	436.28	4641.53	436.39
4647.56	436.5	4654.13	436.67	4666.86	437.19	4679.63	438.12	4682.87	438.51
4692.41	439.8	4700.53	441.99	4705.2	443.3	4718.19	446.37	4730.44	449.57
4735.31	450.92	4743.06	453.26	4752.96	456.67	4763.12	460.37	4768.55	462.37
4770.62	462.94	4781.34	465.4	4788.27	465.61	4794.12	465.66	4805.93	464.69
4811.01	464.19	4814.68	463.42	4826.65	463.33				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1604	.04	1684	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1604	1674	700	502	530	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
340	1250	438	F
2173	4248	438	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1098

INPUT
Description:
Station Elevation Data num= 442

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.02	13.11	433.96	29.61	430.92	46.11	428.9	62.69	428.9
79.12	429.17	95.12	429.51	128.13	429.27	146.54	429.46	177.14	429.87
179.77	429.88	193.65	430.01	196.64	430.11	210.15	430.39	213.52	430.39
226.66	430.48	243.16	430.7	247.13	430.73	259.16	430.9	263.62	431.11
275.67	431.57	280.49	431.99	292.17	432.68	297.36	432.78	308.68	433.2
314.23	433.23	325.18	433.19	330.92	433.12	347.47	433.16	357.69	433.11
374.19	433.18	381.21	433.25	390.69	433.23	398.08	433.24	407.2	433.39
423.2	433.31	431.31	433.35	439.71	433.45	456.21	433.7	472.71	433.77
481.93	433.97	489.22	434.09	498.5	434.29	505.22	434.35	515.16	434.3
521.73	434.33	532.03	434.2	548.91	434.13	554.73	434.13	565.78	434.28
571.24	434.32	582.3	434.36	587.24	434.4	599.01	434.37	603.75	434.34
615.88	434.22	632.75	434.07	653.26	434.04	669.26	433.94	685.76	433.72
716.6	433.58	733.47	433.55	751.28	433.49	766.7	433.59	784.29	433.63
800.45	433.42	817.3	433.32	833.68	433.32	867.42	432.87	882.81	432.8
884.3	432.9	901.11	433.83	915.32	434.78	917.53	434.82	931.82	435.18
951.27	435.27	964.83	435.31	968.14	435.35	981.34	435.39	997.34	435.7
1001.37	435.76	1013.84	435.88	1018.25	435.87	1030.35	435.94	1046.85	436.18
1063.35	436.39	1079.36	436.43	1085.22	436.36	1102.09	436.36	1118.96	436.47
1128.87	436.55	1135.84	436.68	1145.37	436.81	1152.48	436.95	1185.94	437.52
1210.89	437.71	1219.68	437.56	1227.39	437.49	1236.27	437.19	1243.4	437.03
1252.92	436.97	1259.9	436.86	1269.79	436.76	1276.41	436.63	1286.66	436.34

1292.91	436.19	1303.53	435.99	1309.41	435.93	1320.06	435.77	1336.76	435.57
1341.92	435.49	1353.64	435.45	1370.51	435.45	1374.93	435.48	1387.38	435.19
1391.43	435.08	1403.85	434.94	1407.44	434.92	1420.61	434.1	1423.94	433.95
1440.44	432.74	1454.36	432.85	1456.95	432.83	1471.23	431.98	1487.65	431.78
1489.46	431.72	1504.46	430.99	1505.96	430.95	1543	430.4	1564.9	423.2
1611.1	423.2	1633	430.4	1643	430.4	1653.54	430.68	1667.47	430.55
1670.27	430.55	1681.8	430.31	1686.99	430.16	1696.14	430.35	1703.72	430.34
1710.47	430.19	1724.69	430.19	1736.67	430.22	1738.71	430.3	1753.04	430.26
1767.38	430.71	1770.13	430.73	1781.72	430.6	1786.86	430.68	1796.05	430.7
1803.58	430.76	1810.21	431.1	1819.92	431.34	1823.68	431.34	1837.05	431.05
1850.44	431.19	1863.79	431.2	1877.15	431.3	1888.43	431.28	1905.03	431.1
1922.16	431.15	1930.27	431.26	1943.67	431.36	1959.41	431.53	1970.43	431.68
1983.54	431.64	1990.15	431.66	1996.73	431.58	2007.27	431.77	2020.04	431.83
2023.45	431.82	2036.85	431.68	2041.53	431.65	2050.25	431.38	2058.65	431.45
2063.53	431.56	2076.64	431.51	2090.04	431.62	2103.44	431.34	2116.84	431.4
2130.24	431.39	2143.77	431.57	2156.68	431.67	2160.38	431.59	2177.5	431.61
2183.29	431.56	2196.65	431.55	2211.75	431.67	2223.42	431.59	2228.88	431.62
2236.63	431.59	2249.82	431.71	2262.62	431.7	2276.58	431.55	2279.74	431.54
2289.93	431.58	2296.87	431.57	2303.29	431.6	2316.58	431.53	2330.6	431.84
2347.73	431.84	2356.4	431.59	2364.86	431.37	2369.8	431.34	2381.98	431.32
2383.2	431.35	2396.6	431.36	2399.11	431.39	2409.74	431.84	2415.72	432.12
2422.99	432.28	2432.84	432.47	2436.39	432.41	2449.97	431.99	2463.14	431.89
2474.17	431.64	2484.22	431.12	2500.83	431.68	2502.8	431.73	2509.76	431.68
2516.17	431.68	2517.96	431.73	2537.04	432.64	2552.21	432.47	2556.37	432.37
2569.34	432.51	2582.8	432.45	2596.08	432.19	2603.07	432.36	2609.43	432.37
2620.2	432.52	2626.41	432.48	2631.96	432.48	2671.75	432.06	2688.18	432.17
2716.14	432.17	2722.44	432.15	2742.86	432.04	2773.3	432.05	2782.64	431.96
2796	432.15	2807.55	432.03	2809.35	432.05	2824.68	432.04	2835.85	432.14
2841.28	432.14	2849.12	432.24	2858.41	432.48	2875.54	432.56	2889.28	432.34
2892.66	432.36	2902.63	432.35	2909.79	432.37	2915.84	432.46	2926.4	432.49
2928.94	432.45	2943.53	432.46	2955.7	432.53	2960.65	432.62	2978.58	433.01
2981.26	433.05	2993.57	433.01	2997	433.15	3005.7	433.19	3014.86	432.84
3023.77	433.04	3030.09	433.23	3033.28	433.16	3051.71	433.2	3070.13	433.09
3088.55	433.21	3103.46	433.2	3106.41	433.18	3115.64	433.01	3124.84	433.06
3133.95	433.03	3143.26	432.96	3152.48	432.97	3164.79	432.88	3177.1	433
3180.1	432.96	3189.22	432.91	3197.97	432.92	3201.34	432.9	3213.63	432.99
3216.39	432.96	3234.81	432.94	3253.23	433.08	3262.71	433.01	3281.78	433.02
3289.52	432.97	3299.17	432.98	3307.94	433.17	3311.42	433.18	3323.7	433.07
3336.01	433.2	3344.79	432.89	3348.31	432.93	3355.42	432.95	3360.62	433.14
3381.07	433.13	3406.76	434.32	3421.65	434.77	3429.06	434.64	3433.92	434.47
3436.34	434.51	3446.23	434.52	3466.16	434.5	3472.62	434.51	3479.1	434.48
3509.47	433.5	3512.84	433.6	3521.53	433.62	3552.34	434.24	3568.08	433.64
3583.51	432.62	3593.48	431.83	3600.27	431.27	3621.92	433.32	3667.67	433.86
3674.15	433.97	3727.67	433.34	3763.5	434.26	3765.7	434.03	3767.18	433.99
3770.21	433.6	3784.13	432.78	3788.71	432.46	3797.81	432.39	3802.55	432.6
3813.29	433.16	3820.97	433.16	3825.5	433.33	3837.55	433.72	3849.77	433.84
3862.02	433.67	3874.28	434	3886.59	434.77	3894.1	435.12	3898.9	435.01
3908.55	435.16	3911.21	435.13	3923.29	434.73	3926.13	434.58	3937.67	434.28
3996.78	434.12	3999.7	434.04	4004.08	434.58	4009.02	434.51	4021.94	434.23
4033.3	434.24	4040.36	433.67	4043.46	433.33	4058.79	431.1	4063.66	430.86
4108.11	444.04	4117.99	444.52	4141.37	443.33	4149.18	442.86	4160.46	441.07
4205.05	440.12	4211.61	440.48	4223.47	441.84	4234.22	444.43	4265.24	442.08
4314.69	434.98	4323.89	434.74	4327.06	434.77	4333.44	434.76	4350.95	434.62
4363.87	434.65	4376.06	434.6	4388.05	434.74	4406.58	434.86	4425	434.86
4443.42	434.57	4449.48	434.52	4461.69	434.46	4473.85	434.42	4479.71	434.43
4486.04	434.4	4510.6	434.15	4516.55	434.12	4522.84	434.14	4535.32	434.12
4553.39	434.27	4571.26	434.29	4583.9	434.23	4596.14	434.25	4620.7	434.22
4633.01	434.12	4662.81	433.72	4681.23	433.38	4699.65	432.88	4719.7	432.22
4730.93	431.82	4736.5	431.71	4743.1	431.4	4755.17	430.97	4767.43	430.31
4779.67	430.09	4791.21	428.76	4804.22	427.73	4809.63	427.72	4816.53	428.05
4828.05	429	4828.83	429.04	4845.92	431.31	4853.09	432.2	4864.34	433.52
4865.4	433.7	4867.54	433.86	4877.66	434.77	4882.76	435.17	4901.18	436.18
4919.6	437.8	4926.62	437.97	4937.47	438.14	4950.96	438.58	4955.89	438.68
4963.21	439.45	4974.31	442.05	4977.72	442.56	4987.75	444.13	4992.74	444.87
5000.06	446.21	5011.16	448.64	5012.35	449.01	5014.82	450.05	5024.4	453.93
5029.02	456.2	5036.62	458.98	5047.44	462.02	5048.93	462.46	5051.92	463.17
5061.19	465.58	5073.44	465.15	5084.29	463.43	5088.85	462.62	5090.54	462.65
5091.15	462.52	5099.68	462.51						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1543	.04	1653.54	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1543	1633	510	360	381	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2330	4108	438	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 738

INPUT
Description:
Station Elevation Data num= 444

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	434.97	8.43	433.71	24.06	429.99	25.28	429.72	29.91	429.31
42.12	428.3	45.28	428.45	58.97	428.95	66.47	429.3	75.81	429.79
87.22	429.51	108.99	429.11	125.83	429.53	142.68	430.06	159.52	430.34
171.58	430.86	175.86	430.99	192.7	431.16	213.89	431.3	226.39	431.23
235.09	431.32	243.23	431.35	255.79	431.49	274.74	431.45	276.84	431.43
293.26	431.59	298.04	431.67	310.1	431.65	319.24	431.78	339.92	431.83
343.28	431.88	356.77	431.95	361.01	431.95	376.97	432.54	382.29	432.51
393.81	432.95	403.57	433.02	410.66	432.44	424.31	432.97	426.99	432.95
437.55	432.99	445.46	432.92	460.68	432.56	466.66	432.46	487.85	432.04
494.37	432	510.7	432.01	519.57	432.15	526.17	432.29	540.11	432.48
544.39	432.48	561.23	432.34	567.98	432.22	581.82	432.13	611.26	431.71
628.1	431.5	635.27	431.43	656.47	431.3	661.79	431.29	678.12	431.15
682.38	431.14	711.81	431.22	719.42	431.22	740.62	431.37	745.5	431.42
760.66	431.67	767.94	431.89	778.46	432.25	795.15	433.12	811.85	433.52
820.07	433.57	828.55	433.67	839.49	433.53	844.74	433.42	859.12	433.64
861.44	433.65	873.8	434.1	878.93	434.26	894.83	434.68	911.53	434.79
927.72	434.99	937.64	435.05	944.42	435.14	957.41	435.14	977.82	435.44
994.52	435.33	1010.71	435.5	1016.22	435.54	1027.41	435.73	1044.1	435.89
1055.87	435.95	1077.5	436.01	1094.89	436.23	1127.09	436.57	1134.43	436.72
1143.78	436.86	1160.48	437.2	1176.67	437.36	1193.14	437.27	1210.07	437.29
1212.91	437.26	1226.77	437.22	1232.68	437.11	1243.47	436.85	1252.12	436.57
1259.66	436.36	1271.61	436.22	1276.36	436.1	1293.05	435.81	1309.75	435.76
1326.45	435.35	1342.64	435.26	1359.34	435.14	1376.04	435.06	1392.74	434.95
1409.43	434.73	1428.87	433.33	1442.3	431.88	1447.7	430.89	1514	430.1
1539.5	421.5	1578.5	421.5	1604	430.1	1614	430.1	1672.33	431.04
1676.89	431.05	1688.87	431.14	1705.41	430.51	1714.76	430.94	1729.98	431.3
1744.14	431.39	1754.87	431.37	1771.65	431.14	1786.3	431.08	1788.43	431.04
1800.47	431.02	1805.2	431.07	1814.64	431.09	1821.98	430.98	1828.63	430.84
1838.25	430.89	1842.55	430.84	1855.03	430.89	1885.01	430.94	1888.58	430.91
1899.15	430.98	1905.36	431.33	1913.08	431.6	1921.63	431.55	1938.4	431.9
1955.74	431.92	1969.44	432.05	1983.61	432.07	1988.73	432.11	2005	432.11
2011.52	432.16	2025.69	432.2	2038.55	432.28	2054.03	432.27	2072.11	432.35
2082.1	432.34	2105.15	432.18	2155.48	431.86	2166.6	431.91	2171.75	431.88
2180.6	431.93	2188.53	432.02	2208.87	431.96	2237.17	431.97	2238.86	431.96
2255.13	432.12	2265.08	432.24	2271.91	432.36	2279.25	432.37	2288.68	432.23
2293.42	432.3	2305.46	432.04	2319.15	435.05	2322.24	435.76	2335.54	433.57
2338.51	433.23	2349.6	432.51	2355.28	431.84	2363.73	431.69	2372.06	431.35
2377.87	431.27	2388.84	431.33	2406.13	431.21	2432.38	430.9	2438.66	430.71
2448.21	430.55	2455.44	430.33	2472.21	430.24	2476.55	430.36	2488.99	431.07
2490.68	431.06	2500.16	431.24	2505.26	431.3	2518.64	431.17	2522.03	431.25
2532.81	431.19	2538.81	431.19	2546.98	431.62	2555.59	432.69	2561.15	432.75
2572.37	433.24	2575.24	433.28	2588.63	432.09	2589.37	432.09	2611.84	431.11
2622.19	431.12	2627.19	431.03	2643.23	431.17	2672.01	431.98	2681.17	431.8
2701.77	431.3	2715.94	431.17	2722.34	431.18	2730.11	431.53	2739.12	431.66
2744.15	431.67	2755.39	432.09	2772.37	432.15	2786.33	431.93	2800.47	432.08
2805.72	432.04	2814.6	432.04	2822.49	431.93	2828.58	431.8	2854.01	431.85
2856.58	431.9	2862.19	431.74	2872.32	431.58	2884.91	431.85	2889.09	431.86
2905.87	431.77	2913.06	431.98	2922.14	432.1	2926.99	432.1	2941.16	432.23
2972.47	432.37	2989.25	432.6	3005.51	432.88	3022.29	433.06	3025.75	433.12
3039.07	433.2	3054.07	433.13	3072.62	433.16	3082.09	433.78	3088.89	433.84
3096.05	433.85	3105.67	433.82	3122.44	433.88	3134.4	433.5	3139.22	433.41
3152.19	433.84	3164.06	433.69	3176.18	433.7	3187.8	433.67	3194.94	433.59
3214.22	433.53	3223.73	433.55	3235.74	433.69	3252.8	433.55	3259.64	433.56
3295.31	433.24	3302.68	433.07	3310.07	432.96	3319.3	432.9	3331.32	432.88
3359.9	433.28	3372.48	435.42	3388.52	434.11	3397.79	433.5	3405.92	433.6
3414.87	433.6	3425.21	433.76	3426.89	434.11	3429.66	434.24	3438.85	435.24
3444.5	434.91	3450.68	435.28	3453.56	435.01	3462.66	436.45	3518.84	441.14
3521.06	441.05	3524.29	441.31	3540.35	441.31	3556.15	440.27	3569.97	440
3578.34	438.96	3581.99	438.58	3593.97	437.19	3597.63	437.48	3605.91	437.71
3616.91	434.56	3619.4	434.38	3636.2	433.48	3641.77	432.63	3654.9	431.34
3674.19	429.5	3682.65	430.61	3689.39	432.37	3693.48	432.27	3710.08	432.31
3716.71	432.42	3754.75	433.3	3770.04	433.79	3777.76	433.97	3789.33	434.1
3796.98	434.04	3808.61	434.28	3809.63	434.26	3827.9	433.17	3832.8	433.06
3846.6	433.57	3856.51	433.64	3865.89	433.79	3872.87	433.87	3885.18	433.96
3892.55	433.97	3904.46	433.91	3916.51	434.62	3923.75	434.77	3928.37	435.08
3936.12	435.01	3942.45	435.17	3952.08	436.58	3961.74	436.12	3967.99	435.69
3976.06	435.54	3981.03	436.03	3988.01	436.58	3999.37	434.71	4000.31	434.65
4016.19	434.94	4023.1	434.61	4050.23	434.58	4071.21	435.07	4076.88	434.99
4094.48	434.86	4096.16	434.88	4107.54	434.82	4115.45	434.89	4133.92	434.85
4169.91	434.84	4190.86	434.73	4211.3	434.73	4239.23	434.37	4245.79	434.77
4268.72	434.78	4277.31	434.85	4301.26	436.37	4355.41	436.19	4364.43	435.78
4379.82	435.55	4382.25	435.48	4393.01	433.84	4438.54	432.18	4457.01	431.12
4479.56	430.4	4489.65	430.4	4498.85	430.96	4501.61	431.16	4506.32	431.35

4517.55	431.92	4525.33	432.14	4536.84	432.32	4544.49	432.86	4556.13	433.91
4563.77	434.07	4575.42	433.95	4632.59	435.54	4644.75	435.37	4651.98	435.32
4668.78	435.31	4680.8	435.19	4692.77	435.12	4704.51	434.96	4728.54	434.79
4747.83	434.5	4764.33	434.19	4776.28	434.07	4786.41	434.11	4799.96	433.83
4805.11	433.63	4811.87	433.16	4824.4	432.49	4835.9	431.96	4843.68	431.55
4847.91	431.16	4854.91	430.72	4859.9	430.33	4862.97	430.23	4871.85	429.17
4882.26	426.43	4883.76	426.12	4886.29	425.9	4895.53	425.39	4900.96	424.97
4907.44	425.42	4918.15	427.21	4920.25	427.59	4931.39	428.87	4939.53	429.06
4948.91	430.4	4953.08	430.93	4981.4	432.83	5001.46	432.95	5013.27	433.07
5026.27	433.16	5044.65	434.24	5051	434.38	5073.96	435.77	5076.52	435.88
5092.66	435.97	5098.46	435.95	5107.9	436.01	5122.43	435.99	5134.45	435.91
5146.46	435.96	5158.48	435.93	5169.81	435.83	5182.21	435.53	5194.03	435.29
5207.8	435.26	5218.01	435.18	5227.08	435.14	5234.88	436.92	5256.6	442.18
5266.26	445.64	5280.4	449.23	5298.12	456.07	5304.31	457.87	5322.93	465.09
5325.59	465.39	5329.99	465.51	5337.56	465.54	5342.22	465.18	5349.51	465.14
5361.51	464.82	5373.24	463.05	5374.19	462.79	5388.84	462.77		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1514	.04	1672.33	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1514	1604	0	0	0	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
394	1160	438	F
1730	4632	438	F

SUMMARY OF MANNING'S N VALUES

River:Thompsons

Reach	River Sta.	n1	n2	n3
Thompsons	4901	.1	.04	.1
Thompsons	4602	.1	.04	.1
Thompsons	4104	.1	.04	.1
Thompsons	3597	.1	.04	.1
Thompsons	3098	.1	.04	.1
Thompsons	2597	.1	.04	.1
Thompsons	2097	.1	.04	.1
Thompsons	1600	.1	.04	.1
Thompsons	1098	.1	.04	.06
Thompsons	738	.1	.04	.06

SUMMARY OF REACH LENGTHS

River: Thompsons

Reach	River Sta.	Left	Channel	Right
Thompsons	4901	300	299	290
Thompsons	4602	517	498	440
Thompsons	4104	650	507	490
Thompsons	3597	510	499	584
Thompsons	3098	690	501	980
Thompsons	2597	760	500	410
Thompsons	2097	460	497	900
Thompsons	1600	700	502	530
Thompsons	1098	510	360	381
Thompsons	738	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Thompsons

Reach	River Sta.	Contr.	Expan.
Thompsons	4901	.1	.3
Thompsons	4602	.1	.3
Thompsons	4104	.1	.3
Thompsons	3597	.1	.3
Thompsons	3098	.1	.3

Thompsons	2597	.1	.3
Thompsons	2097	.1	.3
Thompsons	1600	.1	.3
Thompsons	1098	.1	.3
Thompsons	738	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Thompsons	4901	100 year	2740.00	429.77	437.28		437.84	0.002649	6.18	589.51	233.39	0.45
Thompsons	4901	25 year	2170.00	429.77	436.78		437.23	0.002373	5.51	476.03	212.58	0.42
Thompsons	4901	10 year	1820.00	429.77	436.36		436.76	0.002260	5.10	392.46	187.75	0.40
Thompsons	4901	5 year	1510.00	429.77	435.88		436.23	0.002204	4.72	321.65	88.76	0.39
Thompsons	4901	2 year	1050.00	429.77	434.91		435.18	0.002074	4.13	254.01	64.84	0.37
Thompsons	4602	100 year	2680.00	429.22	436.45		437.02	0.002883	6.24	611.98	273.09	0.46
Thompsons	4602	25 year	2190.00	429.22	435.94		436.45	0.002875	5.85	475.15	253.11	0.45
Thompsons	4602	10 year	1850.00	429.22	435.54		436.00	0.002819	5.49	377.55	235.22	0.44
Thompsons	4602	5 year	1530.00	429.22	435.11		435.50	0.002639	5.02	304.49	69.35	0.42
Thompsons	4602	2 year	1060.00	429.22	434.22		434.51	0.002334	4.32	245.30	64.03	0.39
Thompsons	4104	100 year	2680.00	428.36	434.78	432.95	435.43	0.003556	6.67	558.88	1357.18	0.51
Thompsons	4104	25 year	2190.00	428.36	434.40	432.43	434.94	0.003194	6.02	464.71	1314.09	0.48
Thompsons	4104	10 year	1850.00	428.36	434.15	432.03	434.60	0.002817	5.46	407.17	1238.49	0.44
Thompsons	4104	5 year	1530.00	428.36	433.89	431.63	434.25	0.002371	4.83	358.17	1100.27	0.40
Thompsons	4104	2 year	1060.00	428.36	433.14	430.97	433.40	0.002103	4.08	260.06	740.13	0.37
Thompsons	3597	100 year	2870.00	427.50	434.77	432.19	434.79	0.000364	2.23	4161.09	2172.90	0.16
Thompsons	3597	25 year	2290.00	427.50	434.28	431.93	434.31	0.000408	2.22	3353.34	1724.83	0.17
Thompsons	3597	10 year	1910.00	427.50	433.94	431.77	433.98	0.000443	2.22	2839.23	1633.64	0.18
Thompsons	3597	5 year	1580.00	427.50	433.61	431.35	433.65	0.000497	2.24	2345.57	1590.27	0.18
Thompsons	3597	2 year	1100.00	427.50	432.83	430.85	432.86	0.000483	2.03	1558.72	1008.99	0.18
Thompsons	3098	100 year	2870.00	426.64	434.55		434.59	0.000454	2.53	3574.89	1689.33	0.18
Thompsons	3098	25 year	2290.00	426.64	434.04		434.08	0.000509	2.52	2778.68	1404.92	0.19
Thompsons	3098	10 year	1910.00	426.64	433.68		433.73	0.000545	2.49	2319.56	1187.84	0.20
Thompsons	3098	5 year	1580.00	426.64	433.32		433.37	0.000596	2.51	1911.44	1107.22	0.20
Thompsons	3098	2 year	1100.00	426.64	432.42		432.52	0.000979	2.97	958.22	805.41	0.26
Thompsons	2597	100 year	3060.00	425.78	434.10	431.64	434.21	0.000792	3.57	3108.08	3652.87	0.25
Thompsons	2597	25 year	2400.00	425.78	433.49	431.01	433.64	0.001049	3.85	1959.42	3387.78	0.28
Thompsons	2597	10 year	1980.00	425.78	433.08	430.18	433.26	0.001185	3.90	1320.93	2876.69	0.29
Thompsons	2597	5 year	1630.00	425.78	432.68	429.66	432.88	0.001291	3.87	861.18	2154.66	0.30
Thompsons	2597	2 year	1110.00	425.78	431.77	428.87	431.93	0.001216	3.40	493.15	967.40	0.29

Thompsons	2097	100 year	3060.00	424.92	433.65	431.65	433.77	0.000816	3.65	2558.15	3235.60	0.25
Thompsons	2097	25 year	2400.00	424.92	432.94	430.01	433.08	0.001027	3.79	1727.05	2934.02	0.28
Thompsons	2097	10 year	1980.00	424.92	432.46	429.49	432.63	0.001200	3.87	1224.95	2741.55	0.29
Thompsons	2097	5 year	1630.00	424.92	432.00	429.00	432.19	0.001348	3.87	874.41	2123.61	0.31
Thompsons	2097	2 year	1110.00	424.92	430.97	428.19	431.20	0.001623	3.90	365.51	388.00	0.33
Thompsons	1600	100 year	3300.00	424.06	432.21	431.04	432.81	0.004288	7.10	848.00	473.12	0.55
Thompsons	1600	25 year	2510.00	424.06	431.39	430.38	431.99	0.004510	6.86	626.01	249.28	0.56
Thompsons	1600	10 year	2060.00	424.06	430.81	429.90	431.43	0.004866	6.81	487.45	224.33	0.57
Thompsons	1600	5 year	1690.00	424.06	430.25	429.11	430.89	0.005270	6.76	369.22	196.61	0.59
Thompsons	1600	2 year	1120.00	424.06	429.21	428.01	429.80	0.005531	6.26	210.14	98.76	0.59
Thompsons	1098	100 year	3300.00	423.20	430.50	428.10	431.00	0.002709	5.96	810.23	470.13	0.45
Thompsons	1098	25 year	2510.00	423.20	429.57	427.30	430.07	0.002982	5.78	509.59	248.16	0.46
Thompsons	1098	10 year	2060.00	423.20	428.95	426.84	429.42	0.003081	5.54	394.78	138.70	0.46
Thompsons	1098	5 year	1690.00	423.20	428.32	426.42	428.76	0.003230	5.32	325.07	100.36	0.46
Thompsons	1098	2 year	1120.00	423.20	427.24	425.69	427.59	0.003342	4.74	236.31	70.78	0.46
Thompsons	738	100 year	3420.00	421.50	429.56	426.98	430.05	0.002504	5.91	727.13	248.67	0.43
Thompsons	738	25 year	2620.00	421.50	428.64	426.24	429.07	0.002500	5.53	551.51	149.06	0.42
Thompsons	738	10 year	2150.00	421.50	428.00	425.65	428.40	0.002501	5.25	466.12	125.03	0.42
Thompsons	738	5 year	1730.00	421.50	427.35	425.08	427.71	0.002504	4.96	388.95	113.86	0.41
Thompsons	738	2 year	1130.00	421.50	426.24	424.26	426.54	0.002502	4.41	272.02	96.26	0.40

HEC-RAS Report for Alternative 1

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HEC-RAS Version 3.1.1 May 2003
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104
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X     X  XXXXXX   XXXX        XXXX      XX      XXXX
X     X  X       X    X       X   X    X  X    X
X     X  X       X            X   X   X    X   X
XXXXXXX  XXXX    X       XXX  XXXX    XXXXXX    XXXX
X     X  X       X            X X     X    X        X
X     X  X       X    X       X  X    X    X        X
X     X  XXXXXX   XXXX        X   X   X    X   XXXXX
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PROJECT DATA
Project Title: Prelim. Analysis Thompson's Branch
Project File : TBrPrelim.prj
Run Date and Time: 6/13/2007 8:17:22 AM

Project in English units

PLAN DATA

Plan Title: Existing Maintained
Plan File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.p02

Geometry Title: GeoRAS Gemometry_Existing_Maintained
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g04

Flow Title : Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

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Plan Summary Information:
Number of:  Cross Sections =   10    Mulitple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance =  0.01
    Critical depth calculaton tolerance =  0.01
    Maximum number of interations       =  20
    Maximum difference tolerance        =  0.3
    Flow tolerance factor               =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

FLOW DATA

Flow Title: Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Flow Data (cfs)

River	Reach	RS	100 year	25 year	10 year	5 year	2 year
Thompsons	Thompsons	4901	2740	2170	1820	1510	1050
Thompsons	Thompsons	4602	2680	2190	1850	1530	1060
Thompsons	Thompsons	3597	2870	2290	1910	1580	1100
Thompsons	Thompsons	2597	3060	2400	1980	1630	1110

Thompsons 1120	Thompsons	1600	3300	2510	2060	1690
Thompsons 1130	Thompsons	738	3420	2620	2150	1730

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Thompsons	Thompsons	100 year		Normal S = 0.0025
Thompsons	Thompsons	25 year		Normal S = 0.0025
Thompsons	Thompsons	10 year		Normal S = 0.0025
Thompsons	Thompsons	5 year		Normal S = 0.0025
Thompsons	Thompsons	2 year		Normal S = 0.0025

GEOMETRY DATA

Geometry Title: GeoRAS Gemometry_Existing_Maintained
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g04

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4901

INPUT
Description:
Station Elevation Data num= 104

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	444.78	3.03	444.68	9.59	444.46	19.83	444.26	26.09	444.15
36.62	443.85	42.59	443.67	53.08	443.35	58.6	443.11	69.7	442.75
75.1	442.6	86.49	442.32	91.6	442.19	103.28	442.02	108.1	441.95
120.08	441.91	124.61	441.89	136.49	441.83	140.61	441.83	153.15	441.66
157.11	441.63	169.95	441.44	173.61	441.36	186.74	441.06	190.12	440.95
203.53	440.64	206.62	440.56	219.9	440.46	222.62	440.35	236.61	439.89
239.12	439.85	253.4	439.82	255.63	439.82	270.2	439.82	272.13	439.78
286.99	439.65	288.63	439.59	303.32	439.27	304.63	439.28	320.07	439.2
321.14	439.19	336.86	439.08	337.64	439.08	353.65	439.15	354.14	439.15
355.48	439.15	365	441.21	385	437.29	401	433.21	415	432.11
418.3	430.2	421.3	429.25	442	432.94	456	436.14	460.3	436.09
465	435.96	472.3	435.73	484.31	435.9	485.14	435.91	500.82	436.04
501.64	436.04	517.34	435.99	518.14	435.99	533.85	436.03	534.64	436.04
549.88	436.11	550.64	436.11	566.37	436.19	567.14	436.2	582.89	436.47
583.64	436.47	599.4	436.77	600.14	436.79	615.91	437.14	616.64	437.16
631.94	438.2	632.64	438.23	648.43	438.84	649.14	438.86	664.95	439.36
665.64	439.39	681.46	440.15	682.14	440.18	697.97	440.73	698.64	440.76
714	441.22	714.64	441.24	730.5	441.78	731.14	441.8	747.01	442.15
747.64	442.18	763.52	442.79	764.14	442.82	780.03	443.48	780.64	443.5
796.06	444.64	796.64	444.66	812.56	446.19	813.14	446.23	829.07	446.25
829.64	446.26	845.58	446.52	846.14	446.54	849.41	446.64		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	385	.04	456	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
385	456	300	299	290	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4602

INPUT
Description:
Station Elevation Data num= 113

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	440.68	3.59	440.73	6.09	440.71	19.59	440.54	22.14	440.49
36.09	439.95	38.61	439.9	52.59	439.67	55.08	439.6	80	439.24
100	435.29	116	431.22	130	430.11	133.3	428.2	157	430.94
171	434.14	175.3	434.09	180	433.96	185.67	434.49	190.58	434.42
196.4	434.34	199.56	434.3	200.73	434.28	212.38	434.18	218.34	434.13
225.21	434.11	235.95	434.1	238.04	434.11	243.63	434.13	250.86	434.17
253.56	434.17	263.47	434.22	270.64	434.28	276.13	434.34	288.25	434.52

288.96	434.54	290.86	434.57	301.74	434.78	305.86	434.82	314.51	435
323.47	435.31	327.29	435.39	337.37	435.61	340.07	435.67	341.08	435.7
352.64	436.01	358.15	436.12	365.34	436.38	375.76	436.79	378.16	436.87
384.6	437.22	390.96	437.55	393.37	437.7	403.74	438.03	410.98	438.38
416.51	438.72	428.59	439.21	429.27	439.23	431.12	439.32	441.8	439.82
445.67	439.98	454.54	440.38	463.28	440.7	467.37	440.84	478.35	441.1
480.2	441.14	480.89	441.16	493.02	441.54	498.5	441.61	505.85	441.8
516.11	442.07	518.62	442.17	525.58	442.45	531.14	442.67	533.18	442.76
543.87	443.07	550.79	443.4	556.64	443.52	568.4	443.96	569.41	443.99
572.09	444.09	582.23	444.39	586.01	444.46	595.06	444.33	603.62	444.34
607.79	444.36	619.32	444.49	620.33	444.5	620.7	444.5	633.09	444.76
638.31	444.86	645.87	445.17	655.91	445.47	658.64	445.49	665.84	445.6
671.44	445.67	673.52	445.69	684.26	445.77	691.13	445.9	696.96	445.89
708.21	446.01	709.53	446.03	713.07	446.06	722.36	446.11	725.82	446.13
735.18	446.25	743.43	446.36	748.01	446.38	760.3	446.68	760.84	446.69
761.04	446.7	773.61	446.85	776.69	446.87				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	100	.04	171	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
100	171	517	498	440	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4104

INPUT
Description:
Station Elevation Data num= 292

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.12	6.1	435.47	11.47	434.9	22.73	433.25	27.97	432.44
39.37	431.58	44.47	431.22	55.65	431.57	60.47	431.69	72.13	431.84
76.98	431.93	88.77	431.49	93.48	431.32	105.4	430.85	109.98	430.64
122.04	430.44	126.48	430.41	138.3	430.82	142.48	430.94	154.81	431.24
158.98	431.34	171.44	431.49	175.48	431.61	200.88	431.42	208.48	431.23
220.95	431.04	224.48	431.03	237.48	431.05	240.98	431.05	254.11	431.21
257.48	431.27	270.75	431.72	273.98	431.74	287.38	432.73	290.48	432.82
303.6	431.55	306.48	431.45	320.15	432.1	322.98	432.18	336.78	432.15
339.48	432.18	353.42	431.89	355.98	431.88	370.05	431.79	372.48	431.78
386.25	431.95	388.48	431.95	402.82	432.01	404.99	432.02	419.45	432.09
421.49	432.12	436.09	432.1	437.99	432.07	452.72	432.19	454.49	432.21
468.9	432.22	470.49	432.24	485.49	432.2	486.99	432.19	502.12	431.97
503.49	431.96	518.76	431.97	519.99	431.96	535.39	431.94	536.49	431.94
551.55	431.93	552.49	431.93	568.16	432.07	568.99	432.08	584.79	432.42
585.49	432.43	601.43	432.73	601.99	432.75	618.06	432.93	618.49	432.94
634.2	433.16	634.49	433.17	650.83	433.59	650.99	433.59	667.46	434.16
667.49	434.16	671.36	434.2	683.99	434.31	684.1	434.31	700.49	434.37
700.72	434.37	716.5	434.17	716.86	434.16	733	434.09	733.49	434.09
749.5	434.03	750.12	434.04	766	434.14	766.76	434.13	782.5	433.84
783.36	433.83	798.5	433.75	799.52	433.75	815	433.8	816.15	433.81
831.5	433.96	832.78	433.94	848	433.99	856.81	433.95	946.5	433.14
948.64	433.11	962.5	432.99	964.84	432.99	979	433.02	981.47	433.01
995.5	433	998.1	433.03	1005.03	433.11	1052.01	433.71	1057.95	433.79
1061.01	433.86	1064.13	433.84	1077.51	433.8	1080.76	433.77	1094.01	433.77
1107.04	436.09	1113.92	436.88	1126.51	437.36	1130.16	437.55	1143.01	438.42
1146.79	438.58	1159.51	439.34	1163.42	439.31	1176.01	439.06	1180.06	439.09
1192.51	439.05	1196.56	439.19	1208.51	439.67	1212.82	439.85	1225.01	440.01
1229.45	440.13	1241.51	440.09	1253.38	439.93	1258.01	439.68	1272.1	439.69
1279.2	439.64	1290.51	439.66	1295.48	439.51	1307.01	439.11	1313	438.94
1347.58	432.54	1363	429.68	1381	428.86	1408	429.52	1419	431.98
1431	432.73	1432.19	432.35	1441.17	432.81	1442.17	432.82	1447.4	432.9
1453.13	433.02	1462.22	433.19	1465.07	433.25	1466.9	433.27	1476.78	433.35
1485.81	433.43	1488.5	433.47	1492.72	433.52	1500.44	433.63	1505.31	433.67
1512.41	433.75	1523.68	433.91	1524.37	433.92	1524.81	433.92	1536.34	434.08
1544.3	434.1	1548.3	434.11	1554.65	434.19	1560.23	434.27	1563.8	434.33
1571.97	434.45	1582.71	434.57	1583.66	434.57	1585.15	434.59	1595.62	434.7
1602.21	434.76	1607.58	434.8	1616.12	434.89	1619.53	434.92	1621.71	434.95
1631.42	435.06	1641.2	435.13	1643.31	435.14	1646.62	435.17	1655.26	435.25
1660.7	435.31	1667.1	435.39	1677.58	435.52	1678.84	435.53	1679.61	435.54
1690.79	435.62	1699.11	435.69	1702.76	435.72	1708.55	435.79	1714.68	435.88
1718.61	435.91	1726.58	435.99	1738.1	436.07	1738.47	436.07	1739.05	436.07
1750.43	436.18	1757.6	436.23	1762.31	436.25	1770.02	436.29	1774.02	436.31
1776.51	436.33	1785.87	436.34	1796.01	436.28	1797.77	436.3	1800.52	436.31
1809.71	436.39	1815.51	436.42	1821.68	436.52	1831.48	436.73	1833.64	436.78
1835	436.8	1845.61	436.96	1854.5	437.08	1857.52	437.13	1862.45	437.2
1869.22	437.28	1873.41	437.37	1881.03	437.5	1892.91	437.6	1892.92	437.6
1892.95	437.6	1904.89	437.81	1912.41	437.9	1916.85	437.95	1923.92	438.04

1928.79	438.1	1931.9	438.17	1940.68	438.35	1951.4	438.4	1952.56	438.42
1954.42	438.44	1964.28	438.57	1970.31	438.61	1976.13	438.66	1985.38	438.75
1988.1	438.78	1989.81	438.81	2000.06	438.94	2009.31	439.06	2012.03	439.09
2016.35	439.11	2023.95	439.16	2028.8	439.21	2035.84	439.34	2046.85	439.53
2047.74	439.54	2048.3	439.55	2059.49	439.81	2067.21	439.95	2071.31	439.98
2077.82	440.09	2083.24	440.19	2086.71	440.25	2095.13	440.39	2106.21	440.59
2107.03	440.61	2108.32	440.67	2118.99	441.06	2125.7	441.4	2130.95	441.5
2139.28	441.65	2142.92	441.72	2145.2	441.76	2154.7	441.89	2164.11	442.07
2166.48	442.13	2170.25	442.26	2178.4	442.54	2183.61	442.79	2190.29	443.04
2200.75	443.27	2202.19	443.31	2203.1	443.38	2214.16	444.45	2222.6	445.58
2226.12	445.89	2231.72	446.62	2238.05	447.2	2242.1	447.27	2249.8	447.34
2261.01	447.46	2261.42	447.47						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1313	.04	1419	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1313	1419	650	507	490	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1229.45	440.13	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3597

INPUT
Description:
Station Elevation Data num= 410

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.05	6.13	435.53	12.12	435.04	22.3	432.82	28.63	431.64
38.46	430.65	45.13	429.97	54.63	430.56	61.63	430.86	70.52	431.18
77.64	431.32	86.46	431.25	94.14	431.17	102.63	431.06	110.64	430.97
118.79	431.07	127.15	431.14	134.96	431.24	143.65	431.34	150.9	431.36
159.66	431.37	166.8	431.34	176.16	431.43	182.96	431.43	192.66	431.47
199.13	431.76	209.17	432.03	215.29	432.18	225.67	432.49	231.28	432.62
241.67	432.65	247.13	432.52	258.18	432.53	263.29	432.5	274.68	432.27
279.46	432.21	291.18	432.11	295.62	432.11	307.69	432.07	311.67	432.01
323.69	431.79	327.46	431.74	340.19	431.55	343.63	431.52	356.7	431.34
359.79	431.34	373.2	431.28	375.96	431.27	389.7	431.4	392.05	431.39
405.71	431.35	407.79	431.34	422.21	431.27	423.96	431.24	438.71	431.08
440.12	431.08	455.22	430.89	456.29	430.89	471.72	430.67	472.43	430.67
487.73	430.67	488.13	430.67	504.23	430.52	504.29	430.52	507.26	430.52
520.46	430.51	520.73	430.51	536.63	430.5	537.24	430.5	552.8	430.54
553.74	430.53	568.52	430.43	569.74	430.43	584.65	430.51	586.25	430.52
600.82	430.48	602.75	430.48	616.99	430.53	619.25	430.53	633.16	430.51
635.76	430.51	648.92	430.58	651.76	430.57	665	430.65	668.26	430.66
681.17	430.76	684.77	430.8	697.34	430.91	701.27	430.96	713.51	431.1
717.77	431.17	729.33	431.29	733.78	431.35	745.36	431.41	750.28	431.42
761.53	431.45	766.78	431.46	777.7	431.58	783.29	431.6	793.87	431.7
799.79	431.79	809.73	431.92	815.8	431.96	825.72	432.1	832.3	432.23
841.89	432.37	848.8	432.46	858.06	432.58	865.31	432.68	874.23	432.88
881.81	433.07	890.14	433.34	897.81	433.42	906.08	433.45	914.32	433.5
922.25	433.47	930.82	433.52	938.42	433.44	947.32	433.39	954.58	433.36
963.83	433.31	970.55	433.27	979.83	433.2	986.43	433.15	996.33	433.08
1002.6	433.05	1012.84	433.02	1018.77	433.03	1029.34	433.02	1034.94	433.03
1045.84	432.99	1050.96	432.89	1061.85	432.73	1066.79	432.66	1078.35	432.54
1082.96	432.55	1094.85	432.56	1099.13	432.56	1111.36	432.58	1115.3	432.51
1127.86	432.44	1131.36	432.46	1143.87	432.4	1147.15	432.4	1160.37	432.39
1163.32	432.38	1176.87	432.35	1179.49	432.35	1193.38	432.34	1195.66	432.35
1209.88	432.6	1211.77	432.61	1225.88	432.74	1227.51	432.74	1242.39	432.72
1243.68	432.7	1258.89	432.78	1259.84	432.77	1275.39	432.94	1276.01	432.94
1306.07	432.53	1307.86	432.51	1307.9	432.5	1324.03	432.6	1324.4	432.57
1340.2	432.67	1340.91	432.68	1356.37	432.85	1357.41	432.85	1372.54	432.64
1373.91	432.63	1388.27	432.57	1398	432.59	1403	431.92	1410	429.9
1421	428.05	1446	427.73	1453.3	429.71	1468	434.4	1473	434.54
1478	434.53	1502.16	433.84	1503.02	433.83	1504.92	433.79	1519.28	433.9
1521.42	433.92	1535.54	434.54	1537.92	434.63	1551.38	434.57	1553.93	434.56
1567.56	434.18	1570.43	434.09	1583.82	434.09	1586.93	434.1	1600.07	434.36
1603.43	434.44	1616.33	434.54	1619.93	434.57	1632.21	434.35	1635.94	434.33
1648.35	434.39	1651.86	434.41	1652.55	434.42	1661.2	434.64	1672.3	434.73
1673.12	434.72	1674.35	434.72	1684.96	434.67	1692.05	434.66	1696.8	434.57
1703.92	434.42	1708.67	434.31	1711.8	434.25	1720.42	434.25	1730.96	434.29
1732.14	434.31	1733.93	434.32	1743.99	434.39	1750.71	434.53	1755.83	434.63
1763.5	434.73	1767.7	434.8	1770.46	434.85	1779.61	434.84	1790.21	434.78
1791.52	434.77	1793.51	434.76	1803.44	434.71	1809.96	434.67	1815.25	434.76
1823.53	434.87	1826.92	434.92	1829.12	434.93	1838.72	435.02	1848.87	435.12
1850.56	435.1	1853.09	435.07	1862.46	434.95	1868.62	434.9	1874.37	434.83

1883.11	434.71	1886.26	434.67	1888.37	434.65	1898.11	434.61	1908.12	434.55
1909.91	434.55	1912.68	434.57	1921.59	434.61	1927.28	434.65	1933.39	434.72
1942.69	434.81	1945.31	434.83	1947.03	434.85	1957.22	434.88	1966.78	434.9
1969.13	434.91	1972.71	434.9	1981	434.89	1986.53	434.89	1992.84	434.88
2002.27	434.87	2004.69	434.86	2006.28	434.86	2016.41	434.89	2025.44	434.86
2028.16	434.85	2032.29	434.83	2040.02	434.78	2045.19	434.75	2051.86	434.71
2061.85	434.68	2063.71	434.68	2064.94	434.67	2075.63	434.65	2084.69	434.62
2087.54	434.62	2091.87	434.6	2099.45	434.58	2104.44	434.53	2111.24	434.54
2121.89	434.52	2122.92	434.52	2123.59	434.51	2134.75	434.5	2143.35	434.43
2146.59	434.42	2151.45	434.47	2158.48	434.55	2163.1	434.55	2170.39	434.55
2181.47	434.64	2182.3	434.65	2182.85	434.65	2194.14	435.03	2202.6	434.89
2205.91	434.74	2211.03	434.85	2217.58	434.83	2221.75	434.88	2229.41	434.66
2241.05	434.54	2241.32	434.53	2241.5	434.52	2253.24	433.77	2261.26	432.99
2265.15	432.78	2271.07	432.43	2277.03	432.11	2281.01	431.99	2288.87	431.79
2300.63	431.53	2300.71	431.53	2300.76	431.53	2312.4	431.59	2319.91	431.32
2324.17	431.36	2330.65	431.32	2336.05	431.71	2339.66	431.85	2347.89	432.05
2359.42	432.97	2359.73	432.99	2360.21	433.02	2371.64	433.41	2379.17	433.94
2383.56	434.05	2390.23	434.18	2395.47	434.01	2398.92	434.12	2407.23	434.33
2418.07	434.78	2418.93	434.83	2420.25	434.88	2430.78	434.97	2437.82	435.14
2442.62	435.22	2449.81	435.43	2454.49	435.52	2457.57	435.63	2466.41	435.74
2477.33	435.98	2478.32	435.95	2479.83	435.9	2490.17	435.42	2497.08	435.28
2501.92	435.27	2509.39	435.21	2513.57	435.16	2516.23	435.14	2525.43	435.16
2535.98	435.19	2537.34	435.18	2539.41	435.18	2549.26	435.19	2555.73	435.17
2561.17	435.19	2569.43	435.15	2573.06	435.15	2575.49	435.15	2584.9	435.37
2595.24	435.58	2596.71	435.6	2598.99	435.66	2608.39	435.93	2614.39	435.97
2620.19	435.98	2629.01	436.09	2632.09	436.13	2634.14	436.16	2643.93	436.19
2653.89	436.19	2655.77	436.2	2658.57	436.21	2667.66	436.21	2673.65	436.27
2679.57	436.36	2688.59	436.46	2691.49	436.49	2693.4	436.54	2703.21	436.89
2712.55	437.03	2714.95	437.11	2718.6	437.24	2726.81	437.6	2732.3	437.71
2738.66	437.86	2748.17	438.29	2750.51	438.4	2752.05	438.44	2762.42	438.55
2771.8	438.75	2774.34	438.78	2778.18	438.84	2786.2	438.89	2791.56	438.95
2797.92	439.02	2807.75	439.11	2809.56	439.14	2810.71	439.17	2821.45	439.34
2830.46	439.6	2833.36	439.69	2837.77	439.74	2845.27	439.85	2850.21	439.93
2857.19	440.1	2867.78	440.27	2869.09	440.3	2869.96	440.32	2875.28	440.48

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1398	.04	1473	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1398	1473	510	499	584	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1770	2438	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3098

INPUT
Description:
Station Elevation Data num= 432

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.2	1.24	436.13	14.84	434.22	17.24	433.89	31.14	431.7
33.74	431.33	47.51	429.83	50.24	429.45	63.89	430.18	66.74	430.35
80.26	430.92	83.24	431.05	96.23	431.18	99.24	431.22	112.51	430.73
115.74	430.64	128.88	430.51	132.24	430.46	145.26	430.79	148.74	430.87
165.24	431.1	177.62	431.14	181.24	431.14	193.88	431.19	197.74	431.2
210.25	431.27	226.63	431.39	230.74	431.43	243	431.49	247.24	431.56
259.01	431.53	263.24	431.51	275.25	431.39	279.74	431.31	291.62	431.34
308	431.42	312.74	431.43	324.37	431.36	329.24	431.34	345.25	431.24
372.99	430.99	378.25	430.92	394.75	431.01	405.74	431.14	411.25	431.23
421.79	431.33	427.25	431.35	437.99	431.34	443.75	431.37	454.36	431.51
460.25	431.56	487.11	431.54	493.25	431.52	503.17	431.64	509.25	431.74
525.75	431.76	542.25	431.89	552.11	431.88	558.75	431.91	568.48	431.99
575.25	432.07	584.56	432.12	591.25	432.17	607.75	432.02	617.1	432.05
624.25	432.03	640.75	432.15	657.25	432.14	665.95	432.11	673.26	432.11
682.1	432.09	689.76	432.05	698.47	432.17	706.26	432.31	714.85	432.39
722.76	432.41	739.26	432.4	755.26	432.36	771.76	432.49	779.84	432.5
788.26	432.49	796.22	432.56	804.76	432.57	812.59	432.65	821.26	432.83
837.26	432.7	844.84	432.66	853.76	432.54	861.21	432.48	870.26	432.53
886.76	432.45	893.96	432.45	903.26	432.4	910.12	432.46	919.26	432.52
926.21	432.55	942.58	432.52	952.26	432.54	958.96	432.53	975.33	432.44
985.26	432.43	991.51	432.46	1001.27	432.47	1007.58	432.52	1017.77	432.56
1023.95	432.56	1040.33	432.63	1050.77	432.76	1056.66	432.94	1059.61	433.39
1072.96	434.33	1080.36	434.32	1102.72	435.18	1109.42	435.54	1137.67	435.54
1143.71	435.47	1238.36	434.69	1261.77	434.41	1334.36	433.31	1336.06	433.21
1339.39	433.02	1345.78	433.39	1355	433	1384	431.97	1395	428.56
1399	425.85	1401.5	425.77	1404.5	426.04	1414	427.71	1427	426.93

1430	426.45	1435	427.29	1452	432.62	1456	433.19	1464.93	433.35
1477.28	433.77	1481.4	433.77	1491.62	433.83	1493.44	433.85	1496.12	433.83
1508.59	433.63	1521.06	433.5	1529.67	433.53	1533.52	433.64	1545.97	433.82
1547.79	433.85	1565.9	434.01	1581.38	433.82	1582.83	433.8	1583.47	433.79
1595.28	433.72	1601.59	433.67	1607.75	433.78	1619.7	433.95	1620.21	433.95
1637.82	434.12	1645.03	434.1	1655.93	434.11	1660.71	434.08	1669.6	434.01
1673.5	433.97	1691.62	434.33	1706.91	434.28	1709.73	434.3	1727.85	433.99
1731.84	434.01	1740.64	433.89	1744.29	433.88	1745.96	433.86	1756.47	434.13
1763.53	434.13	1768.72	434.23	1780.01	434.69	1781.14	434.73	1781.65	434.74
1793.6	434.85	1799.76	434.98	1806.07	434.94	1830.95	434.91	1835.99	434.93
1843.2	434.93	1853.56	434.97	1855.38	434.97	1859.34	434.95	1867.83	434.88
1871.68	434.88	1892.76	434.8	1899.31	434.84	1905.22	434.86	1907.91	434.86
1917.69	434.91	1926.02	435.01	1930.07	435.03	1939.27	435.05	1954.64	435.06
1961.71	435.04	1967.04	435.07	1979.82	435.07	1991.92	435.03	1997.94	435.06
2004.38	435.06	2016.05	434.89	2016.83	434.89	2018.6	434.9	2033.62	435.02
2041.29	434.96	2051.74	434.84	2066.15	434.7	2078.61	434.5	2087.97	434.32
2091.08	434.28	2097.94	434.25	2103.54	434.21	2106.08	434.21	2115.8	434.27
2123.65	434.28	2128.1	434.35	2140.55	434.49	2141.77	434.51	2152.96	434.65
2159.88	434.68	2177.27	434.84	2177.77	434.85	2178	434.85	2196.11	435.05
2202.56	435.09	2213.68	435.13	2227.21	435.12	2231.8	434.94	2239.61	434.9
2249.91	435.05	2252.02	435.04	2264.46	435.59	2268.03	435.65	2286.14	435.6
2289.33	435.56	2296.56	435.52	2301.53	435.46	2303.71	435.46	2313.95	435.42
2321.83	435.49	2326.41	435.5	2338.87	435.33	2339.94	435.33	2351.27	435.4
2358.06	435.37	2363.68	435.44	2375.9	435.51	2376.17	435.51	2388.29	435.55
2393.74	435.58	2411.86	435.44	2413.11	435.41	2415.86	435.37	2429.97	435.11
2437.93	435.05	2448.09	435.15	2450.34	435.16	2455.23	435.17	2466.2	435.21
2487.33	435.38	2512.26	435.47	2520	435.44	2524.73	435.43	2535.16	435.35
2537.19	435.34	2538.12	435.34	2549.59	435.5	2556.23	435.62	2573.8	435.73
2574.03	435.73	2574.52	435.72	2586.49	435.61	2591.92	435.58	2598.96	435.6
2614.49	435.6	2623.84	435.58	2628.15	435.62	2636.25	435.81	2646.26	435.91
2648.61	435.9	2653.85	435.96	2660.78	436.02	2663.83	436.06	2673.18	436.04
2681.95	435.98	2685.65	435.97	2698.12	435.9	2700.06	435.88	2710.58	435.85
2718.18	435.85	2723.05	435.81	2733.79	435.76	2735.5	435.75	2736.29	435.74
2747.67	435.54	2753.86	435.48	2759.94	435.38	2771.98	435.29	2773.15	435.29
2784.81	435.18	2797.27	435.04	2808.21	434.89	2809.74	434.88	2813.12	434.89
2826.32	434.9	2834.4	434.93	2843.89	434.94	2846.6	434.93	2852.48	434.96
2859.04	434.98	2862.01	434.97	2871.5	434.96	2880.12	434.98	2892.45	435.04
2896.43	435.05	2898.24	435.07	2916.35	434.77	2921.26	434.68	2932.42	434.52
2933.46	434.51	2933.92	434.5	2952.04	434.55	2958.26	434.65	2970.15	434.77
2970.67	434.78	2971.78	434.79	2983.13	434.92	2988.27	434.96	3006.38	435.2
3008.02	435.23	3020.19	435.49	3023.95	435.6	3032.51	435.77	3042.07	436
3057.35	436.25	3060.18	436.29	3069.82	436.4	3078.3	436.52	3082.28	436.55
3094.75	436.71	3096.41	436.72	3106.99	436.82	3113.98	436.87	3119.3	436.95
3131.05	437.16	3131.77	437.17	3132.1	437.17	3144.17	437.48	3156.58	437.82
3168.98	438.19	3170.41	438.23	3181.44	438.58	3186.44	438.69	3204.01	438.93
3206	438.94	3218.42	439.05	3222.13	439.04	3230.83	438.94	3240.24	438.92
3243.24	438.88	3255.67	438.66	3258.36	438.62	3268.14	438.74	3276.47	438.63
3280.52	438.6	3292.72	438.53	3294.04	438.5	3305.16	438.37	3317.62	438.27
3329.68	438.43	3330.09	438.44	3330.27	438.44	3342.49	438.29	3348.39	438.29
3354.9	438.2	3366.5	438.23	3367.29	438.22	3369.04	438.21	3379.48	438.13
3384.07	438.13	3391.85	438.2	3402.19	438.16	3404.31	438.16	3409.01	438.05
3416.74	437.93	3420.3	437.54	3429.15	436.75	3438.42	436.43	3441.55	436.19
3448.37	436.12	3453.99	436.01	3456.53	435.89	3466.25	435.51	3474.1	435.3
3478.54	435.31	3488.34	435.44	3491.01	435.47	3492.22	435.49	3503.47	435.78
3510.33	435.97	3528.31	436.64	3528.45	436.65	3546.56	437.43	3553.08	437.7
3564.13	438.28	3565.25	438.32	3577.7	438.98	3582.25	439.5	3590.17	440.53
3600.36	442.08	3602.63	442.5	3607.64	443.56	3615.06	445.11	3618.48	446.45
3627.47	450.49	3636.59	453.78	3639.81	454.45	3647	456.64	3651.97	458.03
3654.16	458.45	3664.39	460.21	3672.28	461.27	3676.86	462	3686.97	464.12
3689.32	464.59	3689.76	464.7	3694.09	466.39	3696.83	466.8	3697.34	466.76
3697.71	466.72	3698.35	466.71						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1384	.04	1452	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1384	1452	690	501	980	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2597

INPUT
Description:
Station Elevation Data num= 471

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.14	14.23	434.39	20.54	433.81	40.1	432.6	41.54	432.48
46.53	432.01	62.22	430.48	66.77	430.13	83.22	430.09	93.45	430.04

103.9	430.21	120.12	430.24	124.9	430.22	145.9	430.39	146.8	430.4
166.58	430.56	172.66	430.62	187.58	430.95	191.94	431.07	196.52	431.22
200.27	431.29	213.03	431.64	217.35	431.7	229.54	431.98	234.43	432.1
246.05	432.16	251.33	432.15	262.05	432.25	268.06	432.32	278.56	432.34
295.07	432.13	302.22	432.09	311.58	432.22	319.29	432.26	328.09	432.17
336.11	432.21	352.93	432.19	360.61	432.2	377.12	432.35	404.16	432.44
410.13	432.41	420.89	432.54	426.14	432.53	437.8	432.46	442.65	432.49
454.88	432.4	471.95	432.36	475.67	432.38	489.03	432.4	492.18	432.4
505.67	432.54	508.19	432.55	522.67	432.59	524.69	432.6	539.74	432.79
541.2	432.8	556.82	433.16	557.71	433.17	573.9	433.06	574.22	433.06
590.23	433.21	590.45	433.21	606.74	433.52	607.52	433.52	623.25	433.44
624.59	433.45	639.76	433.3	641.66	433.32	656.27	433.55	658.65	433.55
672.27	433.68	675.28	433.65	688.78	433.38	709.41	433.26	721.8	433.37
726.48	433.36	743.39	433.22	754.32	433.11	760.1	433.13	770.83	433.15
777.17	433.14	787.34	433.18	794.24	433.18	803.84	433.26	811.3	433.23
836.36	433.07	844.92	432.99	852.87	432.94	869.38	432.77	879.06	432.77
885.89	432.74	896.13	432.79	902.4	432.7	912.86	432.85	918.41	433.03
929.75	432.99	934.91	432.98	946.81	432.93	951.42	432.96	963.88	432.89
980.95	432.72	984.44	432.7	997.59	432.65	1000.45	432.65	1014.57	432.73
1016.96	432.72	1031.64	432.6	1048.71	432.5	1049.98	432.49	1065.77	432.58
1066.49	432.58	1082.33	432.7	1082.49	432.71	1099	432.64	1099.39	432.64
1115.51	432.46	1116.46	432.47	1132.02	432.76	1133.53	432.77	1148.53	432.85
1150.53	432.85	1164.54	432.87	1167.15	432.91	1181.05	433.01	1184.22	433.05
1197.56	433.42	1230.57	433.74	1246.58	433.93	1251.97	433.97	1263.09	434.1
1269.04	434.21	1279.6	434.32	1286.11	434.2	1296.11	434.13	1303.18	433.99
1312.62	433.9	1328.63	433.95	1345.14	434.16	1353.86	434.38	1370.93	434.51
1378.15	434.58	1388	434.48	1394.66	434.39	1404.74	434.4	1410.67	434.47
1421.62	433.65	1434	433.09	1454	428.99	1462	425.37	1469.5	426.15
1487.3	426.68	1491	425.08	1501	425.03	1503.3	426.89	1508	428.03
1524	432.05	1529	432.34	1533	432.48	1542.23	432.61	1557.18	432.77
1558.74	432.79	1573.54	432.65	1574.74	432.64	1590.23	432.57	1591.24	432.56
1606.95	432.63	1607.74	432.63	1623.67	432.72	1624.24	432.72	1640.39	432.83
1640.74	432.83	1656.62	432.85	1673.25	432.83	1673.34	432.83	1689.75	432.9
1690.06	432.9	1706.25	432.95	1706.79	432.95	1722.75	432.82	1723.49	432.82
1738.75	432.8	1739.73	432.79	1755.25	432.7	1756.46	432.7	1771.76	432.6
1773.19	432.57	1788.26	432.49	1795.72	432.49	1800.41	432.5	1804.02	432.5
1805.42	432.51	1816.51	432.57	1829.11	432.67	1841.85	432.74	1845.82	432.77
1854.59	432.86	1858.02	432.86	1875.73	432.94	1880.08	432.99	1891.22	433.1
1892.81	433.12	1893.44	433.12	1905.23	433.26	1910.61	433.3	1917.8	433.33
1928.32	433.31	1930.48	433.3	1943.2	433.3	1955.94	433.44	1963.75	433.46
1981.34	433.3	1981.46	433.3	1993.83	433.24	2016.34	433.36	2019.1	433.36
2026.05	433.57	2031.81	433.68	2034.05	433.74	2044.55	433.95	2051.76	434.13
2057.29	434.18	2069.48	434.31	2070.02	434.29	2071.46	434.24	2082.48	433.77
2086.65	433.63	2095.13	433.46	2104.36	433.07	2107.87	432.98	2120.59	432.97
2122.07	432.96	2123.93	432.9	2125.4	432.88	2168.32	431.7	2181.53	431.68
2197.44	431.53	2246.91	431.46	2297.1	431.03	2297.82	431.01	2298.11	431.01
2310.56	431.12	2315.82	431.18	2323.31	431.12	2333.53	431.18	2335.99	431.16
2342.5	431.21	2348.43	431.22	2350.7	431.21	2361.06	431.14	2373.75	431.15
2386.12	431.12	2387.22	431.12	2399.17	431.08	2403.84	431.01	2411.91	430.99
2421.55	431.1	2424.59	431.11	2432.62	431.25	2437.03	431.32	2438.72	431.3
2449.68	431.71	2456.43	431.73	2462.26	431.67	2487.78	430.84	2491.85	430.94
2500.52	431.03	2509.56	430.99	2513.18	430.95	2522.74	430.8	2525.64	430.76
2526.74	430.75	2538.36	430.5	2544.45	430.45	2562.16	430.4	2563.84	430.4
2568.14	430.42	2576.54	430.43	2589.23	430.58	2601.82	430.63	2614.76	430.62
2626.96	430.68	2632.47	430.77	2639.71	430.84	2650.18	430.92	2652.45	430.95
2658.26	431.07	2665.16	431.18	2667.89	431.21	2677.84	431.27	2685.6	431.34
2690.42	431.37	2702.77	431.56	2702.98	431.56	2728.31	431.68	2748.38	431.62
2755.91	431.62	2773.62	431.65	2779.15	431.67	2790.79	431.68	2791.63	431.69
2793.78	431.7	2808.5	431.82	2817.01	431.87	2826.21	431.88	2829.7	431.89
2842.4	431.86	2843.92	431.87	2861.64	431.93	2867.75	431.99	2880.24	432.25
2892.94	432.4	2896.52	432.45	2918.31	432.49	2928.62	432.56	2931.01	432.58
2931.94	432.59	2943.75	432.67	2966.83	432.75	2968.85	432.79	2974.02	432.84
2981.59	432.95	2984.54	432.95	2994.33	432.97	3002.25	432.96	3007.07	432.99
3019.43	432.94	3019.96	432.94	3032.5	432.91	3037.67	432.91	3045.02	432.69
3054.85	432.45	3057.48	432.39	3064.14	432.19	3070.2	432.03	3078.01	431.98
3096.66	432.03	3106.98	432.18	3107.98	432.19	3121.11	432.19	3125.69	432.07
3133.62	431.92	3142.86	431.98	3146.1	432.06	3154.26	431.96	3158.8	431.92
3160.57	431.93	3171.54	431.96	3178.29	432.09	3184.28	431.96	3196	431.8
3199.66	431.69	3209.77	431.41	3213.71	431.33	3222.31	431.27	3230.88	430.99
3234.86	431.02	3245.07	431	3247.59	431.02	3248.59	431	3260.28	431.35
3266.3	431.33	3272.96	431.35	3284.01	431.64	3285.65	431.68	3289.78	431.81
3298.37	432.02	3301.72	432.12	3310.91	432.12	3318.9	432.24	3323.47	432.22
3335.19	432.31	3336.21	432.32	3337.54	432.32	3372.03	432.35	3374.26	432.34
3379.9	432.3	3386.98	432.23	3389.74	432.22	3399.5	432.15	3406.92	432.12
3412.08	432.08	3424.63	431.93	3424.82	431.93	3425.3	431.92	3442.34	431.81
3450.3	431.78	3460.05	431.77	3463.04	431.76	3488.21	432.14	3494.93	432.25
3500.75	432.27	3512.64	432.24	3513.43	432.24	3515.42	432.27	3526.16	432.39
3530.35	432.46	3538.91	432.64	3548.07	432.73	3556.99	432.78	3560.83	432.81
3638.52	433.16	3640.25	433.16	3650.94	433.18	3652.99	433.19	3665.47	433.19
3670.97	433.22	3688.68	433.2	3690.83	433.21	3703.54	433.38	3706.39	433.43
3716.23	433.67	3724.1	433.79	3741.06	434.01	3741.81	434.01	3758.99	434.14

3766.7	434.17	3776.7	434.3	3786.47	434.48	3792.16	434.56	3794.41	434.57
3804.84	434.72	3812.12	434.67	3817.53	434.57	3830.21	434.56	3831.18	434.57
3842.66	434.63	3855.31	434.71	3864.71	434.74	3868.05	434.71	3876.59	434.41
3880.79	434.29	3882.43	434.19	3893.53	433.42	3900.14	432.95	3906.27	432.72
3917.85	432.66	3918.98	432.71	3921.99	432.99	3931.41	433.94	3935.02	434.24
3944.01	434.97	3952.73	435.27	3956.7	435.38	3966.71	436.05	3969.39	436.2
3970.44	436.29	3982.14	436.81	3988.15	437.36	3994.88	438.09	4005.87	439.54
4007.58	439.88	4012.11	440.56	4020.01	441.91	4023.04	442.56	4032.62	444.75
4040.75	446.25	4045.31	446.94	4056.82	448.58	4058	448.75	4058.46	448.81
4076.17	453.01	4093.88	455.59	4096.17	456	4111.06	458.83	4121.32	460.43
4128.77	461.29	4134.06	462.15	4146.48	463.12	4146.8	463.16	4147.63	463.04
4154.29	461.97								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1434	.04	1524	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1434	1524	760	500	410	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2069	3842	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2097

INPUT
Description:
Station Elevation Data num= 444

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.08	8.65	435.23	17.96	434.13	25.15	432.93	34.18	431.92
41.65	430.74	50.14	430.13	57.66	429.98	66.13	430.05	74.16	430.38
82.36	430.39	90.66	430.57	123.67	430.48	130.81	430.64	139.67	431.04
146.76	431.27	156.17	431.65	162.98	431.74	172.67	431.83	179.2	432.02
189.18	432.13	195.43	432.42	205.68	432.92	211.47	433.17	221.68	433.58
238.18	433.96	243.6	434.03	254.68	434.11	266.15	434.14	276.05	434.37
287.69	434.39	292.14	434.24	303.69	434.21	308.01	434.18	320.19	434.23
324.23	434.21	336.7	434.17	340.45	434.18	353.2	434.24	356.68	434.24
372.8	434.13	385.7	434.12	388.63	434.1	402.21	434.06	421.08	434.19
437.3	434.29	451.71	434.4	453.47	434.4	484.22	434.59	517.92	434.59
533.72	434.65	549.73	434.67	599.23	434.65	630.56	434.71	648.24	434.71
664.74	434.93	679.2	435.01	681.25	435.03	695.43	434.85	697.75	434.83
713.75	434.55	727.39	434.58	730.25	434.57	746.76	434.62	763.26	434.55
776.08	434.43	779.76	434.41	791.93	434.37	795.76	434.35	812.26	434.34
824.27	434.48	828.77	434.54	840.49	434.6	845.27	434.64	861.77	434.69
872.62	434.68	877.77	434.65	888.68	434.67	921.14	434.62	927.28	434.63
937.37	434.58	953.3	434.32	959.79	434.26	969.33	434.23	976.29	434.19
985.56	434.17	992.79	434.13	1009.29	433.83	1018.01	433.69	1033.99	433.51
1041.8	433.52	1049.97	433.5	1074.8	433.18	1082.43	433.2	1091.3	433.18
1107.81	433.26	1114.67	433.27	1123.81	433.23	1130.62	433.24	1140.31	433.17
1146.85	433.14	1156.81	433.02	1163.07	432.99	1173.32	433.06	1179.3	433.13
1189.82	433.29	1195.36	433.36	1205.82	433.52	1211.26	433.57	1222.32	433.69
1227.49	433.76	1238.83	433.94	1243.72	433.97	1255.33	434.09	1259.95	434.09
1276.04	434.05	1287.83	434.08	1291.91	434.14	1304.34	434.28	1320.84	434.37
1324.36	434.36	1337.34	434.22	1340.59	434.15	1353.84	433.72	1369.84	433.17
1372.55	433.11	1386.35	432.92	1405.01	432.82	1419.35	432.78	1421.23	432.73
1437.41	432.24	1451.86	431.85	1453.2	431.83	1456	430.99	1488	430.75
1499	424.13	1501.5	423.25	1506.5	424.27	1512.5	424.85	1535	425.87
1554	431.02	1563	431.64	1577.51	432.04	1578.18	432.09	1602.8	432.42
1614.27	432.5	1617.74	432.51	1631.67	432.5	1640.07	432.41	1652.64	432.45
1665.24	432.41	1678.22	432.41	1684.85	432.37	1691.2	432.36	1702.25	432.42
1704.14	432.42	1719.13	432.6	1729.83	432.71	1736.53	432.64	1742.86	432.52
1753.94	432.33	1755.89	432.31	1761.69	432.33	1768.92	432.34	1771.34	432.33
1781.95	432.23	1788.75	432.23	1794.84	432.26	1805.63	432.27	1823.03	432.1
1833.6	432.04	1840.44	431.96	1846.58	431.92	1857.84	431.96	1864.6	432.05
1875.25	432.24	1885.36	432.29	1892.12	432.24	1898.24	432.25	1909.53	432.32
1911.27	432.41	1916.45	432.49	1926.93	432.71	1937.25	433.05	1944.34	433.1
1950.23	432.9	1961.74	432.76	1967.51	432.65	1975.89	432.47	1978.62	432.46
1988.86	432.46	1996.03	432.4	2001.89	432.4	2013.43	432.38	2027.95	432.17
2030.83	432.15	2040.98	432.28	2048.24	432.31	2053.88	432.27	2065.12	432.26
2071.2	432.21	2079.64	432.12	2082.52	432.12	2092.62	432	2099.93	431.85
2105.6	431.66	2117.33	431.08	2118.59	431.06	2131.6	431.09	2134.74	431.09
2151.61	431.22	2157.27	431.3	2169.02	431.39	2170.3	431.41	2183.29	431.48
2203.83	431.48	2209.26	431.44	2221.23	431.39	2234.93	431.35	2238.11	431.35
2272.92	431.29	2290.33	431.24	2300.01	431.24	2307.73	431.2	2312.92	431.19
2324.61	431.24	2338.67	431.14	2351.65	431.08	2359.42	431.02	2364.63	431.01
2376.82	431.03	2390.63	431.11	2403.45	431.27	2416.3	431.32	2429.33	431.4
2442.32	431.3	2445.92	431.29	2463.32	431.27	2468.28	431.29	2481.25	431.28

2493.98	431.32	2497.6	431.38	2506.92	431.46	2532.41	431.58	2532.98	431.59
2546.01	431.6	2549.82	431.61	2559.04	431.67	2567.22	431.68	2584.1	431.75
2597.7	431.75	2601.5	431.71	2610.68	431.46	2636.31	431.28	2649.67	431.26
2653.72	431.29	2661.5	431.41	2685.2	431.52	2688.36	431.56	2701.35	431.89
2705.41	431.85	2714.33	431.71	2722.81	431.83	2727.31	431.82	2740.5	431.91
2765.95	431.73	2774.5	431.71	2791.68	431.79	2805.05	431.87	2817.88	431.75
2826.71	431.75	2831.01	431.74	2844.19	431.84	2861	431.92	2869.7	431.73
2895.81	431.69	2908.7	431.86	2913.21	431.93	2934.36	432.32	2947.1	432.44
2964.9	432.41	2973.35	432.38	2982.3	432.33	2999.71	432.13	3002.73	432.13
3025.99	432.1	3040.42	432.02	3050.01	432.11	3051.4	432.11	3064.08	431.77
3068.8	431.82	3077.11	431.96	3086.21	431.95	3101.85	432.01	3115.75	431.97
3120.49	432.02	3137.89	432.05	3152.91	430.66	3155.3	430.43	3172.7	430.43
3180.58	430.69	3189.58	430.88	3193.4	430.93	3206.99	431.26	3219.4	431.52
3224.39	431.57	3232.38	431.58	3245.36	431.53	3258.35	431.54	3259.2	431.53
3271.1	431.5	3276.08	431.48	3284.02	431.39	3307.67	431.48	3310.89	431.48
3323.11	431.45	3336.14	431.39	3345.7	431.28	3349.09	431.25	3359.52	431.3
3364.16	431.28	3379.98	431.17	3397.38	430.98	3400.74	430.92	3410.58	430.82
3414.79	430.8	3426.76	430.72	3432.19	430.6	3439.62	430.53	3449.07	430.59
3452.43	430.69	3462.42	430.63	3466.48	430.66	3478.43	430.83	3483.88	430.87
3504.39	431.13	3517.38	431.23	3518.69	431.26	3530.15	431.4	3535.57	431.45
3543.05	431.38	3552.97	431.33	3556.08	431.33	3565.33	431.26	3570.38	431.24
3587.78	431.26	3595.17	431.23	3605.19	431.23	3608.13	431.26	3620.85	431.3
3633.8	431.28	3639.47	431.35	3646.78	431.46	3656.88	431.47	3659.77	431.49
3674.28	431.5	3685.79	431.44	3698.66	431.31	3720.09	431.29	3725.97	431.3
3737.45	431.38	3743.37	431.38	3750.43	431.42	3760.78	431.43	3763.41	431.42
3776.41	431.48	3789.19	431.32	3812.46	431.12	3815.11	431.12	3847.27	431.25
3864.68	431.22	3879.89	431.14	3892.83	431.14	3898.96	431.2	3905.81	431.22
3918.79	431.23	3931.79	431.13	3933.77	431.1	3944.82	431.11	3951.18	431.14
3957.7	431.14	3968.05	431.18	3970.49	431.17	3983.5	431.16	3985.46	431.14
4020.27	431.04	4035.45	430.99	4037.67	430.97	4048.23	430.8	4061.11	430.73
4071.96	430.64	4074.14	430.63	4087.17	430.52	4089.36	430.48	4100.2	430.23
4106.77	430.2	4113.23	430.07	4124.17	430.96	4126.22	431.15	4132.5	431.34
4138.93	431.56	4141.05	431.73	4151.86	432.87	4158.45	433.11	4164.84	433.31
4177.82	433.54	4183.56	433.59	4193.26	433.69	4203.86	433.84	4210.67	433.96
4216.74	434.09	4229.52	434.39	4242.52	434.61	4244.95	434.69	4255.51	435.1
4262.35	435.52	4276.29	436.85	4279.76	437.1	4281.47	437.32	4286.47	438.22
4294.48	439.63	4297.16	440.18	4307.27	443	4314.04	444.8	4320.14	446.35
4331.45	449.13	4333.17	449.47	4346.2	452.36	4348.85	453.01	4359.23	455.1
4366.26	456.5	4372.27	457.89	4383.66	461	4385.26	461.53	4390.16	462.71
4397.96	464.72	4400.54	465.02	4410.88	465.76	4417.94	465.67	4423.86	465.02
4435.35	463.54	4436.84	463.33	4443.7	462.73	4444.4	462.77		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1488	.04	1554	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
1488 1554 460 497 900 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
280	1320	436	F
1944	3775	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1600

INPUT
Description:
Station Elevation Data num= 449

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.32	2.04	436.18	18.54	433.35	26.39	431.64	35.04	429.99
51.54	427.75	59.58	428.01	68.04	428.15	75.93	428.7	84.04	429.35
92.27	429.5	100.54	429.61	117.04	429.58	133.54	429.8	142.06	430.15
150.04	430.41	158.39	431.02	166.04	431.61	174.75	432.16	182.54	432.52
191.35	432.77	199.04	433.2	215.54	433.45	224.54	433.45	240.86	433.63
248.04	433.66	257.23	433.62	264.54	433.72	273.83	433.74	281.04	433.7
290.43	433.72	297.54	433.8	307.02	433.81	323.33	433.76	330.04	433.78
339.71	433.88	346.54	433.87	356.31	433.76	363.04	433.72	372.91	433.72
379.54	433.69	389.5	433.67	396.04	433.6	405.79	433.55	412.04	433.57
428.54	433.36	438.79	433.2	445.04	433.08	455.39	433.08	461.54	433.05
471.99	432.89	478.04	432.82	494.04	432.58	510.54	432.5	521.27	432.54
527.04	432.61	543.55	433.17	554.47	433.26	560.05	433.28	570.73	433.43
576.05	433.54	587.16	433.46	592.55	433.36	609.05	433.23	620.35	433.02
625.55	432.88	636.95	432.73	653.19	432.65	658.05	432.64	669.64	432.53
686.24	432.28	691.05	432.19	702.83	432.1	707.55	432.11	719.43	432.35
724.05	432.42	735.66	432.71	740.05	432.78	752.12	432.88	756.55	432.9
773.05	433.03	785.31	433.1	789.55	433.16	806.05	433.36	822.05	433.52
834.6	433.66	838.55	433.69	855.05	433.72	871.55	433.51	888.05	432.95

900.6	432.46	904.05	432.34	917.08	432.38	920.55	432.38	933.68	432.8
937.05	432.89	953.55	433.06	970.05	433.14	983.06	433.35	986.05	433.38
1002.55	433.62	1016.16	433.97	1019.05	434.02	1032.76	434.17	1035.55	434.22
1052.05	434.37	1068.05	434.41	1082.05	434.62	1101.05	434.99	1117.55	435.43
1131.84	435.66	1150.06	436.07	1166.56	436.22	1181.12	436.32	1183.06	436.35
1197.72	436.44	1214.32	436.56	1232.06	436.65	1249.82	436.68	1257.04	436.66
1270.87	436.66	1281.44	436.59	1287.05	436.57	1293.61	436.5	1305.99	436.44
1317.75	436.31	1323.71	436.28	1329.86	436.2	1341.65	436.16	1354.32	435.7
1360.93	435.39	1366.55	435.1	1379.54	434.22	1390.94	433.83	1398.16	433.57
1403	433.31	1412.43	432.97	1414.94	432.92	1427.14	433.02	1434.82	432.96
1439.37	432.86	1453.43	432.93	1463.75	432.67	1472.04	432.43	1475.91	432.4
1488.1	432.36	1490.65	432.37	1500.14	432.29	1508.7	432.33	1513.21	432.26
1525.28	432.14	1541.78	432.23	1546.64	432.22	1558.28	432.27	1561	432.48
1581	432.28	1596	428.55	1604.5	425.23	1609	423.21	1617	422.71
1631	423.86	1634.3	426.17	1649.6	430.38	1655	430.9	1661	431.03
1672.82	431.26	1680.52	431.34	1689.32	431.45	1696.86	431.4	1705.82	431.43
1713.19	431.64	1722.32	431.88	1731.63	431.57	1745.65	431.33	1764.47	431.33
1773.59	431.14	1784.61	431.08	1796.25	430.85	1804.89	430.7	1814.59	430.7
1821.26	430.8	1823.67	430.76	1830.71	430.85	1892.63	431.85	1907.82	431.88
1917.09	431.86	1930.3	431.92	1946.12	431.93	1952.96	431.97	1962.73	431.99
1985.47	432.14	1998.61	432.15	2010.7	432.17	2015.16	432.21	2036.17	432.24
2050.47	432.17	2061.74	432.25	2068.13	432.18	2073.63	432.17	2093.82	432.17
2099.83	432.13	2113.15	432.49	2121.19	432.64	2138.22	434.15	2155.87	434.61
2164.19	434.84	2173.53	435.08	2184.72	435.13	2188.83	435.26	2216.38	432.37
2263.44	432.45	2282.5	432.42	2293.34	432.43	2313.71	432.41	2331.37	432.25
2349.02	432.25	2366.15	432.02	2417.61	432.46	2419.12	432.48	2436.77	432.48
2459.36	431.97	2468.19	431.69	2471.55	431.69	2489.21	431.99	2493.76	432.04
2505.72	431.99	2506.86	432	2519.33	432.57	2524.52	432.52	2531.95	432.48
2541.64	432.52	2544.52	432.44	2552.07	432.4	2557.28	432.35	2570.01	432.33
2576.95	432.29	2594.61	432.45	2608.26	432.61	2620.85	432.63	2633.44	432.61
2647.04	432.67	2658.95	432.55	2671.68	432.55	2684.41	432.59	2697.18	432.54
2700.01	432.54	2709.74	432.49	2717.13	432.49	2722.36	432.45	2734.79	432.49
2760.72	432.46	2773.51	432.51	2787.76	432.5	2798.76	432.45	2811.36	432.45
2822.54	432.4	2836.86	432.37	2849.65	432.42	2862.43	432.45	2875.51	432.58
2887.67	432.61	2910.28	432.49	2920.11	432.4	2925.78	432.32	2927.94	432.32
2938.57	432.24	2951.35	432.2	2966.47	432.14	2976.62	432.08	2980.37	432.08
2998.03	432.14	3012.83	432.36	3027.62	432.64	3033.34	432.78	3046.78	432.62
3071.06	432.29	3103.1	432.6	3104.84	432.59	3118.47	432.26	3153.01	433.5
3154.4	433.61	3155.87	433.5	3169.84	433.33	3173.52	433.27	3187.7	432.66
3191.18	432.48	3196.85	432.51	3205.53	432.64	3208.84	432.64	3218.32	432.7
3226.49	432.77	3256.23	432.79	3261.27	432.85	3268.96	432.74	3278.93	432.77
3288.86	432.76	3294.45	432.73	3296.58	432.64	3307.24	432.53	3314.24	432.57
3319.9	432.49	3331.36	432.46	3335.21	432.47	3345.17	432.57	3349.02	432.55
3357.9	432.64	3370.63	432.66	3384.33	432.83	3396.16	432.86	3408.79	432.96
3419.11	433.96	3421.35	433.99	3427.22	435.43	3434.13	436.92	3436.76	436.92
3439.03	436.43	3442.71	436.27	3485.01	433.43	3492.47	433.07	3506.85	433.07
3524.51	432.99	3535.84	433.06	3542.17	433.03	3559.82	433.09	3565.59	432.99
3577.48	432.7	3586.69	432.51	3594.6	432.48	3599.24	432.54	3611.24	432.66
3629.91	433.02	3647.57	433.2	3650.34	433.25	3663.12	433.36	3675.67	433.34
3682.35	433.31	3688.31	433.31	3700	433.38	3717.66	433.44	3735.32	433.47
3739.3	433.5	3752.97	433.54	3764.57	433.5	3770.09	433.54	3777.23	433.55
3790.02	433.43	3795.96	433.43	3805.41	433.39	3823.06	433.33	3828.24	433.39
3841.62	433.35	3853.46	433.41	3857.84	433.41	3875.5	433.24	3887.97	433.26
3904.51	433.3	3917.3	433.38	3928.47	433.4	3934.33	433.35	3945.59	433.22
3955.18	433.03	3963.24	432.94	3980.9	432.88	3993.43	432.93	4006.22	433.03
4026.34	433.1	4031.43	433.11	4044.11	433.22	4056.85	433.25	4068.65	433.24
4082.35	433.14	4086.3	433.13	4103.96	433.24	4121.08	433.3	4133.11	433.31
4158.68	433.12	4171.44	433.08	4174.05	433.06	4184.17	433.1	4191.71	433.16
4196.79	433.22	4208.83	433.33	4222.03	433.4	4226.48	433.38	4234.82	433.44
4247.61	433.38	4261.79	433.35	4273.11	433.18	4279.45	433.12	4285.7	433.14
4296.57	433.13	4302.37	433.15	4314.23	433.16	4323.74	433.02	4348.72	433.08
4362.1	433.07	4367.2	433.04	4387.29	433.05	4401.98	433	4419.63	432.73
4425.52	432.66	4440.73	432.57	4451.02	432.48	4454.94	432.48	4463.61	432.4
4472.07	432.16	4476.21	431.99	4487.09	431.7	4488.99	431.61	4501.72	430.51
4507.38	429.85	4514.45	428.93	4525.04	429.42	4527.19	429.43	4532.74	430.12
4539.95	430.88	4552.51	432.9	4559.81	433.66	4565.13	434.42	4577.47	435.03
4590.71	435.43	4603.49	435.85	4612.78	436.06	4616.28	436.12	4630.44	436.28
4641.53	436.39	4647.56	436.5	4654.13	436.67	4666.86	437.19	4679.63	438.12
4682.87	438.51	4692.41	439.8	4700.53	441.99	4705.2	443.3	4718.19	446.37
4730.44	449.57	4735.31	450.92	4743.06	453.26	4752.96	456.67	4763.12	460.37
4768.55	462.37	4770.62	462.94	4781.34	465.4	4788.27	465.61	4794.12	465.66
4805.93	464.69	4811.01	464.19	4814.68	463.42	4826.65	463.33		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1581	.04	1655	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1581	1655	700	502	530	.1	.3

Ineffective Flow num= 2

Sta L Sta R Elev Permanent

340	1250	438	F
2173	4248	438	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1098

INPUT
Description:
Station Elevation Data num= 448

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.02	13.11	433.96	29.61	430.92	46.11	428.9	62.69	428.9
79.12	429.17	95.12	429.51	128.13	429.27	146.54	429.46	177.14	429.87
179.77	429.88	193.65	430.01	196.64	430.11	210.15	430.39	213.52	430.39
226.66	430.48	243.16	430.7	247.13	430.73	259.16	430.9	263.62	431.11
275.67	431.57	280.49	431.99	292.17	432.68	297.36	432.78	308.68	433.2
314.23	433.23	325.18	433.19	330.92	433.12	347.47	433.16	357.69	433.11
374.19	433.18	381.21	433.25	390.69	433.23	398.08	433.24	407.2	433.39
423.2	433.31	431.31	433.35	439.71	433.45	456.21	433.7	472.71	433.77
481.93	433.97	489.22	434.09	498.5	434.29	505.22	434.35	515.16	434.3
521.73	434.33	532.03	434.2	548.91	434.13	554.73	434.13	565.78	434.28
571.24	434.32	582.3	434.36	587.24	434.4	599.01	434.37	603.75	434.34
615.88	434.22	632.75	434.07	653.26	434.04	669.26	433.94	685.76	433.72
716.6	433.58	733.47	433.55	751.28	433.49	766.7	433.59	784.29	433.63
800.45	433.42	817.3	433.32	833.68	433.32	867.42	432.87	882.81	432.8
884.3	432.9	901.11	433.83	915.32	434.78	917.53	434.82	931.82	435.18
951.27	435.27	964.83	435.31	968.14	435.35	981.34	435.39	997.34	435.7
1001.37	435.76	1013.84	435.88	1018.25	435.87	1030.35	435.94	1046.85	436.18
1063.35	436.39	1079.36	436.43	1085.22	436.36	1102.09	436.36	1118.96	436.47
1128.87	436.55	1135.84	436.68	1145.37	436.81	1152.48	436.95	1185.94	437.52
1210.89	437.71	1219.68	437.56	1227.39	437.49	1236.27	437.19	1243.4	437.03
1252.92	436.97	1259.9	436.86	1269.79	436.76	1276.41	436.63	1286.66	436.34
1292.91	436.19	1303.53	435.99	1309.41	435.93	1320.06	435.77	1336.76	435.57
1341.92	435.49	1353.64	435.45	1370.51	435.45	1374.93	435.48	1387.38	435.19
1391.43	435.08	1403.85	434.94	1407.44	434.92	1420.61	434.1	1423.94	433.95
1440.44	432.74	1454.36	432.85	1456.95	432.83	1471.23	431.98	1487.65	431.78
1489.46	431.72	1504.46	430.99	1505.96	430.95	1516	430.07	1545	427.65
1551	425.31	1557	423.95	1561	421.7	1569.7	421.84	1574	424.39
1596	424.21	1614	426.1	1634	429.93	1637.47	429.77	1653.54	430.68
1667.47	430.55	1670.27	430.55	1681.8	430.31	1686.99	430.16	1696.14	430.35
1703.72	430.34	1710.47	430.19	1724.69	430.19	1736.67	430.22	1738.71	430.3
1753.04	430.26	1767.38	430.71	1770.13	430.73	1781.72	430.6	1786.86	430.68
1796.05	430.7	1803.58	430.76	1810.21	431.1	1819.92	431.34	1823.68	431.34
1837.05	431.05	1850.44	431.19	1863.79	431.2	1877.15	431.3	1888.43	431.28
1905.03	431.1	1922.16	431.15	1930.27	431.26	1943.67	431.36	1959.41	431.53
1970.43	431.68	1983.54	431.64	1990.15	431.66	1996.73	431.58	2007.27	431.77
2020.04	431.83	2023.45	431.82	2036.85	431.68	2041.53	431.65	2050.25	431.38
2058.65	431.45	2063.53	431.56	2076.64	431.51	2090.04	431.62	2103.44	431.34
2116.84	431.4	2130.24	431.39	2143.77	431.57	2156.68	431.67	2160.38	431.59
2177.5	431.61	2183.29	431.56	2196.65	431.55	2211.75	431.67	2223.42	431.59
2228.88	431.62	2236.63	431.59	2249.82	431.71	2262.62	431.7	2276.58	431.55
2279.74	431.54	2289.93	431.58	2296.87	431.57	2303.29	431.6	2316.58	431.53
2330.6	431.84	2347.73	431.84	2356.4	431.59	2364.86	431.37	2369.8	431.34
2381.98	431.32	2383.2	431.35	2396.6	431.36	2399.11	431.39	2409.74	431.84
2415.72	432.12	2422.99	432.28	2432.84	432.47	2436.39	432.41	2449.97	431.99
2463.14	431.89	2474.17	431.64	2484.22	431.12	2500.83	431.68	2502.8	431.73
2509.76	431.68	2516.17	431.68	2517.96	431.73	2537.04	432.64	2552.21	432.47
2556.37	432.37	2569.34	432.51	2582.8	432.45	2596.08	432.19	2603.07	432.36
2609.43	432.37	2620.2	432.52	2626.41	432.48	2631.96	432.48	2671.75	432.06
2688.18	432.17	2716.14	432.17	2722.44	432.15	2742.86	432.04	2773.3	432.05
2782.64	431.96	2796	432.15	2807.55	432.03	2809.35	432.05	2824.68	432.04
2835.85	432.14	2841.28	432.14	2849.12	432.24	2858.41	432.48	2875.54	432.56
2889.28	432.34	2892.66	432.36	2902.63	432.35	2909.79	432.37	2915.84	432.46
2926.4	432.49	2928.94	432.45	2943.53	432.46	2955.7	432.53	2960.65	432.62
2978.58	433.01	2981.26	433.05	2993.57	433.01	2997	433.15	3005.7	433.19
3014.86	432.84	3023.77	433.04	3030.09	433.23	3033.28	433.16	3051.71	433.2
3070.13	433.09	3088.55	433.21	3103.46	433.2	3106.41	433.18	3115.64	433.01
3124.84	433.06	3133.95	433.03	3143.26	432.96	3152.48	432.97	3164.79	432.88
3177.1	433	3180.1	432.96	3189.22	432.91	3197.97	432.92	3201.34	432.9
3213.63	432.99	3216.39	432.96	3234.81	432.94	3253.23	433.08	3262.71	433.01
3281.78	433.02	3289.52	432.97	3299.17	432.98	3307.94	433.17	3311.42	433.18
3323.7	433.07	3336.01	433.2	3344.79	432.89	3348.31	432.93	3355.42	432.95
3360.62	433.14	3381.07	433.13	3406.76	434.32	3421.65	434.77	3429.06	434.64
3433.92	434.47	3436.34	434.51	3446.23	434.52	3466.16	434.5	3472.62	434.51
3479.1	434.48	3509.47	433.5	3512.84	433.6	3521.53	433.62	3552.34	434.24
3568.08	433.64	3583.51	432.62	3593.48	431.83	3600.27	431.27	3621.92	433.32
3667.67	433.86	3674.15	433.97	3727.67	433.34	3763.5	434.26	3765.7	434.03
3767.18	433.99	3770.21	433.6	3784.13	432.78	3788.71	432.46	3797.81	432.39
3802.55	432.6	3813.29	433.16	3820.97	433.16	3825.5	433.33	3837.55	433.72

3849.77	433.84	3862.02	433.67	3874.28	434	3886.59	434.77	3894.1	435.12
3898.9	435.01	3908.55	435.16	3911.21	435.13	3923.29	434.73	3926.13	434.58
3937.67	434.28	3996.78	434.12	3999.7	434.04	4004.08	434.58	4009.02	434.51
4021.94	434.23	4033.3	434.24	4040.36	433.67	4043.46	433.33	4058.79	431.1
4063.66	430.86	4108.11	444.04	4117.99	444.52	4141.37	443.33	4149.18	442.86
4160.46	441.07	4205.05	440.12	4211.61	440.48	4223.47	441.84	4234.22	444.43
4265.24	442.08	4314.69	434.98	4323.89	434.74	4327.06	434.77	4333.44	434.76
4350.95	434.62	4363.87	434.65	4376.06	434.6	4388.05	434.74	4406.58	434.86
4425	434.86	4443.42	434.57	4449.48	434.52	4461.69	434.46	4473.85	434.42
4479.71	434.43	4486.04	434.4	4510.6	434.15	4516.55	434.12	4522.84	434.14
4535.32	434.12	4553.39	434.27	4571.26	434.29	4583.9	434.23	4596.14	434.25
4620.7	434.22	4633.01	434.12	4662.81	433.72	4681.23	433.38	4699.65	432.88
4719.7	432.22	4730.93	431.82	4736.5	431.71	4743.1	431.4	4755.17	430.97
4767.43	430.31	4779.67	430.09	4791.21	428.76	4804.22	427.73	4809.63	427.72
4816.53	428.05	4828.05	429	4828.83	429.04	4845.92	431.31	4853.09	432.2
4864.34	433.52	4865.4	433.7	4867.54	433.86	4877.66	434.77	4882.76	435.17
4901.18	436.18	4919.6	437.8	4926.62	437.97	4937.47	438.14	4950.96	438.58
4955.89	438.68	4963.21	439.45	4974.31	442.05	4977.72	442.56	4987.75	444.13
4992.74	444.87	5000.06	446.21	5011.16	448.64	5012.35	449.01	5014.82	450.05
5024.4	453.93	5029.02	456.2	5036.62	458.98	5047.44	462.02	5048.93	462.46
5051.92	463.17	5061.19	465.58	5073.44	465.15	5084.29	463.43	5088.85	462.62
5090.54	462.65	5091.15	462.52	5099.68	462.51				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1545	.04	1634	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1545	1634	510	360	381	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2330	4108	438	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 738

INPUT
Description:
Station Elevation Data num= 450

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	434.97	8.43	433.71	24.06	429.99	25.28	429.72	29.91	429.31
42.12	428.3	45.28	428.45	58.97	428.95	66.47	429.3	75.81	429.79
87.22	429.51	108.99	429.11	125.83	429.53	142.68	430.06	159.52	430.34
171.58	430.86	175.86	430.99	192.7	431.16	213.89	431.3	226.39	431.23
235.09	431.32	243.23	431.35	255.79	431.49	274.74	431.45	276.84	431.43
293.26	431.59	298.04	431.67	310.1	431.65	319.24	431.78	339.92	431.83
343.28	431.88	356.77	431.95	361.01	431.95	376.97	432.54	382.29	432.51
393.81	432.95	403.57	433.02	410.66	432.44	424.31	432.97	426.99	432.95
437.55	432.99	445.46	432.92	460.68	432.56	466.66	432.46	487.85	432.04
494.37	432	510.7	432.01	519.57	432.15	526.17	432.29	540.11	432.48
544.39	432.48	561.23	432.34	567.98	432.22	581.82	432.13	611.26	431.71
628.1	431.5	635.27	431.43	656.47	431.3	661.79	431.29	678.12	431.15
682.38	431.14	711.81	431.22	719.42	431.22	740.62	431.37	745.5	431.42
760.66	431.67	767.94	431.89	778.46	432.25	795.15	433.12	811.85	433.52
820.07	433.57	828.55	433.67	839.49	433.53	844.74	433.42	859.12	433.64
861.44	433.65	873.8	434.1	878.93	434.26	894.83	434.68	911.53	434.79
927.72	434.99	937.64	435.05	944.42	435.14	957.41	435.14	977.82	435.44
994.52	435.33	1010.71	435.5	1016.22	435.54	1027.41	435.73	1044.1	435.89
1055.87	435.95	1077.5	436.01	1094.89	436.23	1127.09	436.57	1134.43	436.72
1143.78	436.86	1160.48	437.2	1176.67	437.36	1193.14	437.27	1210.07	437.29
1212.91	437.26	1226.77	437.22	1232.68	437.11	1243.47	436.85	1252.12	436.57
1259.66	436.36	1271.61	436.22	1276.36	436.1	1293.05	435.81	1309.75	435.76
1326.45	435.35	1342.64	435.26	1359.34	435.14	1376.04	435.06	1392.74	434.95
1409.43	434.73	1428.87	433.33	1442.3	431.88	1447.7	430.89	1458.83	429.19
1540.72	425.34	1574.1	423.67	1590.14	422.57	1606.68	421.76	1623.22	423.27
1624.13	423.44	1639.75	426.67	1641.89	427.14	1656.29	429.6	1659.55	429.83
1672.33	431.04	1676.89	431.05	1688.87	431.14	1705.41	430.51	1714.76	430.94
1729.98	431.3	1744.14	431.39	1754.87	431.37	1771.65	431.14	1786.3	431.08
1788.43	431.04	1800.47	431.02	1805.2	431.07	1814.64	431.09	1821.98	430.98
1828.63	430.84	1838.25	430.89	1842.55	430.84	1855.03	430.89	1885.01	430.94
1888.58	430.91	1899.15	430.98	1905.36	431.33	1913.08	431.6	1921.63	431.55
1938.4	431.9	1955.74	431.92	1969.44	432.05	1983.61	432.07	1988.73	432.11
2005	432.11	2011.52	432.16	2025.69	432.2	2038.55	432.28	2054.03	432.27
2072.11	432.35	2082.1	432.34	2105.15	432.18	2155.48	431.86	2166.6	431.91
2171.75	431.88	2180.6	431.93	2188.53	432.02	2208.87	431.96	2237.17	431.97
2238.86	431.96	2255.13	432.12	2265.08	432.24	2271.91	432.36	2279.25	432.37
2288.68	432.23	2293.42	432.3	2305.46	432.04	2319.15	435.05	2322.24	435.76
2335.54	433.57	2338.51	433.23	2349.6	432.51	2355.28	431.84	2363.73	431.69

2372.06	431.35	2377.87	431.27	2388.84	431.33	2406.13	431.21	2432.38	430.9
2438.66	430.71	2448.21	430.55	2455.44	430.33	2472.21	430.24	2476.55	430.36
2488.99	431.07	2490.68	431.06	2500.16	431.24	2505.26	431.3	2518.64	431.17
2522.03	431.25	2532.81	431.19	2538.81	431.19	2546.98	431.62	2555.59	432.69
2561.15	432.75	2572.37	433.24	2575.24	433.28	2588.63	432.09	2589.37	432.09
2611.84	431.11	2622.19	431.12	2627.19	431.03	2643.23	431.17	2672.01	431.98
2681.17	431.8	2701.77	431.3	2715.94	431.17	2722.34	431.18	2730.11	431.53
2739.12	431.66	2744.15	431.67	2755.39	432.09	2772.37	432.15	2786.33	431.93
2800.47	432.08	2805.72	432.04	2814.6	432.04	2822.49	431.93	2828.58	431.8
2854.01	431.85	2856.58	431.9	2862.19	431.74	2872.32	431.58	2884.91	431.85
2889.09	431.86	2905.87	431.77	2913.06	431.98	2922.14	432.1	2926.99	432.1
2941.16	432.23	2972.47	432.37	2989.25	432.6	3005.51	432.88	3022.29	433.06
3025.75	433.12	3039.07	433.2	3054.07	433.13	3072.62	433.16	3082.09	433.78
3088.89	433.84	3096.05	433.85	3105.67	433.82	3122.44	433.88	3134.4	433.5
3139.22	433.41	3152.19	433.84	3164.06	433.69	3176.18	433.7	3187.8	433.67
3194.94	433.59	3214.22	433.53	3223.73	433.55	3235.74	433.69	3252.8	433.55
3259.64	433.56	3295.31	433.24	3302.68	433.07	3310.07	432.96	3319.3	432.9
3331.32	432.88	3359.9	433.28	3372.48	435.42	3388.52	434.11	3397.79	433.5
3405.92	433.6	3414.87	433.6	3425.21	433.76	3426.89	434.11	3429.66	434.24
3438.85	435.24	3444.5	434.91	3450.68	435.28	3453.56	435.01	3462.66	436.45
3518.84	441.14	3521.06	441.05	3524.29	441.31	3540.35	441.31	3556.15	440.27
3569.97	440	3578.34	438.96	3581.99	438.58	3593.97	437.19	3597.63	437.48
3605.91	437.71	3616.91	434.56	3619.4	434.38	3636.2	433.48	3641.77	432.63
3654.9	431.34	3674.19	429.5	3682.65	430.61	3689.39	432.37	3693.48	432.27
3710.08	432.31	3716.71	432.42	3754.75	433.3	3770.04	433.79	3777.76	433.97
3789.33	434.1	3796.98	434.04	3808.61	434.28	3809.63	434.26	3827.9	433.17
3832.8	433.06	3846.6	433.57	3856.51	433.64	3865.89	433.79	3872.87	433.87
3885.18	433.96	3892.55	433.97	3904.46	433.91	3916.51	434.62	3923.75	434.77
3928.37	435.08	3936.12	435.01	3942.45	435.17	3952.08	436.58	3961.74	436.12
3967.99	435.69	3976.06	435.54	3981.03	436.03	3988.01	436.58	3999.37	434.71
4000.31	434.65	4016.19	434.94	4023.1	434.61	4050.23	434.58	4071.21	435.07
4076.88	434.99	4094.48	434.86	4096.16	434.88	4107.54	434.82	4115.45	434.89
4133.92	434.85	4169.91	434.84	4190.86	434.73	4211.3	434.73	4239.23	434.37
4245.79	434.77	4268.72	434.78	4277.31	434.85	4301.26	436.37	4355.41	436.19
4364.43	435.78	4379.82	435.55	4382.25	435.48	4393.01	433.84	4438.54	432.18
4457.01	431.12	4479.56	430.4	4489.65	430.4	4498.85	430.96	4501.61	431.16
4506.32	431.35	4517.55	431.92	4525.33	432.14	4536.84	432.32	4544.49	432.86
4556.13	433.91	4563.77	434.07	4575.42	433.95	4632.59	435.54	4644.75	435.37
4651.98	435.32	4668.78	435.31	4680.8	435.19	4692.77	435.12	4704.51	434.96
4728.54	434.79	4747.83	434.5	4764.33	434.19	4776.28	434.07	4786.41	434.11
4799.96	433.83	4805.11	433.63	4811.87	433.16	4824.4	432.49	4835.9	431.96
4843.68	431.55	4847.91	431.16	4854.91	430.72	4859.9	430.33	4862.97	430.23
4871.85	429.17	4882.26	426.43	4883.76	426.12	4886.29	425.9	4895.53	425.39
4900.96	424.97	4907.44	425.42	4918.15	427.21	4920.25	427.59	4931.39	428.87
4939.53	429.06	4948.91	430.4	4953.08	430.93	4981.4	432.83	5001.46	432.95
5013.27	433.07	5026.27	433.16	5044.65	434.24	5051	434.38	5073.96	435.77
5076.52	435.88	5092.66	435.97	5098.46	435.95	5107.9	436.01	5122.43	435.99
5134.45	435.91	5146.46	435.96	5158.48	435.93	5169.81	435.83	5182.21	435.53
5194.03	435.29	5207.8	435.26	5218.01	435.18	5227.08	435.14	5234.88	436.92
5256.6	442.18	5266.26	445.64	5280.4	449.23	5298.12	456.07	5304.31	457.87
5322.93	465.09	5325.59	465.39	5329.99	465.51	5337.56	465.54	5342.22	465.18
5349.51	465.14	5361.51	464.82	5373.24	463.05	5374.19	462.79	5388.84	462.77

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1458.83	.04	1672.33	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1458.83	1672.33	0	0	0	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
394	1160	438	F
1730	4632	438	F

SUMMARY OF MANNING'S N VALUES

River:Thompsons

Reach	River Sta.	n1	n2	n3
Thompsons	4901	.1	.04	.1
Thompsons	4602	.1	.04	.1
Thompsons	4104	.1	.04	.1
Thompsons	3597	.1	.04	.1
Thompsons	3098	.1	.04	.1
Thompsons	2597	.1	.04	.1
Thompsons	2097	.1	.04	.1
Thompsons	1600	.1	.04	.1
Thompsons	1098	.1	.04	.06

Thompsons	738	.1	.04	.06

SUMMARY OF REACH LENGTHS

River: Thompsons

Reach	River Sta.	Left	Channel	Right
Thompsons	4901	300	299	290
Thompsons	4602	517	498	440
Thompsons	4104	650	507	490
Thompsons	3597	510	499	584
Thompsons	3098	690	501	980
Thompsons	2597	760	500	410
Thompsons	2097	460	497	900
Thompsons	1600	700	502	530
Thompsons	1098	510	360	381
Thompsons	738	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Thompsons

Reach	River Sta.	Contr.	Expan.
Thompsons	4901	.1	.3
Thompsons	4602	.1	.3
Thompsons	4104	.1	.3
Thompsons	3597	.1	.3
Thompsons	3098	.1	.3
Thompsons	2597	.1	.3
Thompsons	2097	.1	.3
Thompsons	1600	.1	.3
Thompsons	1098	.1	.3
Thompsons	738	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Thompsons	4901	100 year	2740.00	429.25	437.50		438.32	0.005853	7.65	530.75	237.70	0.63
Thompsons	4901	25 year	2170.00	429.25	437.02		437.75	0.005705	7.08	418.63	224.28	0.62
Thompsons	4901	10 year	1820.00	429.25	436.64		437.32	0.005712	6.74	336.68	204.75	0.61
Thompsons	4901	5 year	1510.00	429.25	436.24		436.87	0.005728	6.38	260.82	180.46	0.60
Thompsons	4901	2 year	1050.00	429.25	435.50		435.99	0.005296	5.60	187.41	61.21	0.56
Thompsons	4602	100 year	2680.00	428.20	436.68		437.11	0.002502	5.70	785.73	280.06	0.43
Thompsons	4602	25 year	2190.00	428.20	436.18	434.33	436.57	0.002497	5.35	649.52	264.38	0.42
Thompsons	4602	10 year	1850.00	428.20	435.78	433.78	436.14	0.002514	5.08	547.25	246.61	0.42
Thompsons	4602	5 year	1530.00	428.20	435.36	433.36	435.69	0.002540	4.78	447.37	226.20	0.41
Thompsons	4602	2 year	1060.00	428.20	434.59		434.87	0.002544	4.30	285.22	188.95	0.40
Thompsons	4104	100 year	2680.00	428.86	434.66	433.58	435.37	0.005158	6.99	535.27	1342.14	0.60
Thompsons	4104	25 year	2190.00	428.86	434.28	433.02	434.89	0.004764	6.43	443.92	1276.79	0.57
Thompsons	4104	10 year	1850.00	428.86	434.03	432.65	434.54	0.004226	5.86	390.88	1162.58	0.53
Thompsons	4104	5 year	1530.00	428.86	433.71	432.28	434.15	0.003841	5.36	333.92	972.21	0.50

Thompsons	4104	2 year	1060.00	428.86	433.23	431.68	433.52	0.002908	4.34	263.91	812.27	0.43
Thompsons	3597	100 year	2870.00	427.73	434.63	432.28	434.65	0.000383	2.01	4220.32	2024.69	0.16
Thompsons	3597	25 year	2290.00	427.73	434.14	432.06	434.17	0.000423	2.07	3438.68	1656.07	0.17
Thompsons	3597	10 year	1910.00	427.73	433.79	431.89	433.82	0.000468	2.09	2922.91	1573.38	0.18
Thompsons	3597	5 year	1580.00	427.73	433.42	431.74	433.45	0.000488	2.04	2384.94	1516.85	0.18
Thompsons	3597	2 year	1100.00	427.73	432.70	431.27	432.73	0.000748	2.26	1440.32	1231.61	0.22
Thompsons	3098	100 year	2870.00	425.77	434.38		434.43	0.000498	2.72	3393.64	1622.79	0.19
Thompsons	3098	25 year	2290.00	425.77	433.86		433.92	0.000560	2.72	2628.38	1336.42	0.20
Thompsons	3098	10 year	1910.00	425.77	433.48		433.54	0.000620	2.74	2152.67	1186.97	0.21
Thompsons	3098	5 year	1580.00	425.77	433.06		433.14	0.000758	2.86	1662.11	1137.82	0.23
Thompsons	3098	2 year	1100.00	425.77	432.11		432.24	0.001278	3.27	747.52	681.73	0.29
Thompsons	2597	100 year	3060.00	425.03	433.90	431.22	434.03	0.000879	3.53	2791.19	3548.60	0.26
Thompsons	2597	25 year	2400.00	425.03	433.30	430.43	433.46	0.001103	3.69	1711.28	3190.36	0.28
Thompsons	2597	10 year	1980.00	425.03	432.87	429.76	433.05	0.001234	3.72	1117.66	2559.82	0.29
Thompsons	2597	5 year	1630.00	425.03	432.42	429.33	432.59	0.001273	3.60	753.88	1713.47	0.30
Thompsons	2597	2 year	1110.00	425.03	431.42	428.59	431.57	0.001266	3.26	462.10	710.48	0.29
Thompsons	2097	100 year	3060.00	423.25	433.38	430.50	433.54	0.000917	4.02	2316.00	3136.93	0.27
Thompsons	2097	25 year	2400.00	423.25	432.69	429.59	432.88	0.001081	4.07	1544.92	2858.66	0.28
Thompsons	2097	10 year	1980.00	423.25	432.20	429.07	432.40	0.001216	4.09	1088.19	2380.21	0.30
Thompsons	2097	5 year	1630.00	423.25	431.66	428.61	431.90	0.001398	4.12	740.46	1771.24	0.31
Thompsons	2097	2 year	1110.00	423.25	430.59	427.82	430.83	0.001645	3.92	309.95	230.33	0.33
Thompsons	1600	100 year	3300.00	422.71	432.19	430.74	432.63	0.003052	6.16	1138.12	870.68	0.47
Thompsons	1600	25 year	2510.00	422.71	431.45	429.88	431.90	0.003272	5.95	743.45	439.14	0.48
Thompsons	1600	10 year	2060.00	422.71	430.92	428.97	431.37	0.003450	5.78	560.42	281.42	0.48
Thompsons	1600	5 year	1690.00	422.71	430.33	428.31	430.80	0.003446	5.74	424.49	206.64	0.48
Thompsons	1600	2 year	1120.00	422.71	429.31	427.14	429.71	0.003174	5.13	254.07	107.35	0.45
Thompsons	1098	100 year	3300.00	421.70	429.98	428.55	430.69	0.004491	7.03	631.75	331.77	0.56
Thompsons	1098	25 year	2510.00	421.70	429.31	427.76	429.94	0.004366	6.45	447.71	202.85	0.54
Thompsons	1098	10 year	2060.00	421.70	428.87	427.31	429.41	0.004173	5.99	371.81	134.22	0.52
Thompsons	1098	5 year	1690.00	421.70	428.42	426.91	428.90	0.004067	5.58	315.75	115.86	0.51
Thompsons	1098	2 year	1120.00	421.70	427.63	426.21	427.97	0.003683	4.70	238.13	76.91	0.47
Thompsons	738	100 year	3420.00	421.76	429.09	427.00	429.37	0.002501	4.41	864.90	289.33	0.41
Thompsons	738	25 year	2620.00	421.76	428.41	426.51	428.66	0.002501	4.14	689.18	230.10	0.40
Thompsons	738	10 year	2150.00	421.76	427.95	426.16	428.18	0.002504	3.96	588.84	208.24	0.39
Thompsons	738	5 year	1730.00	421.76	427.48	425.78	427.69	0.002501	3.77	495.48	190.00	0.39
Thompsons	738	2 year	1130.00	421.76	426.66	425.10	426.84	0.002503	3.42	352.12	160.55	0.38

HEC-RAS Report for Alternative 2

HEC-RAS Version 3.1.1 May 2003
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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X     X  XXXXXX   XXXX        XXXX      XX     XXXX
X     X  X       X    X       X   X    X  X   X
X     X  X       X            X   X   X    X  X
XXXXXXX  XXXX    X       XXX  XXXX    XXXXXX   XXXX
X     X  X       X            X  X    X    X      X
X     X  X       X    X       X   X   X    X      X
X     X  XXXXXX   XXXX        X    X  X    X  XXXXX
```

PROJECT DATA
Project Title: Prelim. Analysis Thompson's Branch
Project File : TBrPrelim.prj
Run Date and Time: 5/16/2007 4:40:40 PM

Project in English units

PLAN DATA

Plan Title: Ext Geo 50' Channel w/ Concrete
Plan File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.p08

Geometry Title: Ext Geo 50' Channel w/ Concrete
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g10

Flow Title : Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Plan Summary Information:

Number of:	Cross Sections =	10	Mulitple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information
- Water surface calculation tolerance = 0.01
- Critical depth calculaton tolerance = 0.01
- Maximum number of interations = 20
- Maximum difference tolerance = 0.3
- Flow tolerance factor = 0.001

Computation Options
- Critical depth computed only where necessary
- Conveyance Calculation Method: At breaks in n values only
- Friction Slope Method: Average Conveyance
- Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Flow Data (cfs)

River	Reach	RS	100 year	25 year	10 year	5 year	2 year
Thompsons	Thompsons	4901	2740	2170	1820	1510	1050
Thompsons	Thompsons	4602	2680	2190	1850	1530	1060
Thompsons	Thompsons	3597	2870	2290	1910	1580	1100
Thompsons	Thompsons	2597	3060	2400	1980	1630	1110
Thompsons	Thompsons	1600	3300	2510	2060	1690	1120
Thompsons	Thompsons	738	3420	2620	2150	1730	1130

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Thompsons	Thompsons	100 year		Normal S = 0.0025
Thompsons	Thompsons	25 year		Normal S = 0.0025
Thompsons	Thompsons	10 year		Normal S = 0.0025
Thompsons	Thompsons	5 year		Normal S = 0.0025
Thompsons	Thompsons	2 year		Normal S = 0.0025

GEOMETRY DATA

Geometry Title: Ext Geo 50' Channel w/ Concrete
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g10

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4901

INPUT
Description:
Station Elevation Data num= 101

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	444.78	3.03	444.68	9.59	444.46	19.83	444.26	26.09	444.15
36.62	443.85	42.59	443.67	53.08	443.35	58.6	443.11	69.7	442.75
75.1	442.6	86.49	442.32	91.6	442.19	103.28	442.02	108.1	441.95
120.08	441.91	124.61	441.89	136.49	441.83	140.61	441.83	153.15	441.66
157.11	441.63	169.95	441.44	173.61	441.36	186.74	441.06	190.12	440.95
203.53	440.64	206.62	440.56	219.9	440.46	222.62	440.35	236.61	439.89
239.12	439.85	253.4	439.82	255.63	439.82	270.2	439.82	272.13	439.78
286.99	439.65	288.63	439.59	303.32	439.27	304.63	439.28	320.07	439.2
321.14	439.19	336.86	439.08	337.64	439.08	353.65	439.15	354.14	439.15
355.48	439.15	365	441.21	383.5	437.58	404	430.75	417.35	430.75
429.71	430.75	454	430.75	469.23	435.83	472.3	435.73	484.31	435.9
485.14	435.91	500.82	436.04	501.64	436.04	517.34	435.99	518.14	435.99
533.85	436.03	534.64	436.04	549.88	436.11	550.64	436.11	566.37	436.19
567.14	436.2	582.89	436.47	583.64	436.47	599.4	436.77	600.14	436.79
615.91	437.14	616.64	437.16	631.94	438.2	632.64	438.23	648.43	438.84
649.14	438.86	664.95	439.36	665.64	439.39	681.46	440.15	682.14	440.18
697.97	440.73	698.64	440.76	714	441.22	714.64	441.24	730.5	441.78
731.14	441.8	747.01	442.15	747.64	442.18	763.52	442.79	764.14	442.82
780.03	443.48	780.64	443.5	796.06	444.64	796.64	444.66	812.56	446.19
813.14	446.23	829.07	446.25	829.64	446.26	845.58	446.52	846.14	446.54
849.41	446.64								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	383.5	.013	469.23	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
383.5	469.23	300	299	290	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4602

INPUT
Description: XS-4602
Station Elevation Data num= 112

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	440.68	3.59	440.73	6.09	440.71	19.59	440.54	22.14	440.49
36.09	439.95	38.61	439.9	52.59	439.67	55.08	439.6	80	439.24
95.41	436.2	114	430	130.19	430	148.87	430	164	430
176.2	434.07	180	433.96	185.67	434.49	190.58	434.42	196.4	434.34
199.56	434.3	200.73	434.28	212.38	434.18	218.34	434.13	225.21	434.11
235.95	434.1	238.04	434.11	243.63	434.13	250.86	434.17	253.56	434.17
263.47	434.22	270.64	434.28	276.13	434.34	288.25	434.52	288.96	434.54
290.86	434.57	301.74	434.78	305.86	434.82	314.51	435	323.47	435.31
327.29	435.39	337.37	435.61	340.07	435.67	341.08	435.7	352.64	436.01
358.15	436.12	365.34	436.38	375.76	436.79	378.16	436.87	384.6	437.22
390.96	437.55	393.37	437.7	403.74	438.03	410.98	438.38	416.51	438.72
428.59	439.21	429.27	439.23	431.12	439.32	441.8	439.82	445.67	439.98
454.54	440.38	463.28	440.7	467.37	440.84	478.35	441.1	480.2	441.14
480.89	441.16	493.02	441.54	498.5	441.61	505.85	441.8	516.11	442.07
518.62	442.17	525.58	442.45	531.14	442.67	533.18	442.76	543.87	443.07
550.79	443.4	556.64	443.52	568.4	443.96	569.41	443.99	572.09	444.09
582.23	444.39	586.01	444.46	595.06	444.33	603.62	444.34	607.79	444.36
619.32	444.49	620.33	444.5	620.7	444.5	633.09	444.76	638.31	444.86
645.87	445.17	655.91	445.47	658.64	445.49	665.84	445.6	671.44	445.67
673.52	445.69	684.26	445.77	691.13	445.9	696.96	445.89	708.21	446.01
709.53	446.03	713.07	446.06	722.36	446.11	725.82	446.13	735.18	446.25
743.43	446.36	748.01	446.38	760.3	446.68	760.84	446.69	761.04	446.7
773.61	446.85	776.69	446.87						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	95.41	.013	176.2	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
95.41	176.2	517	498	440	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4104

INPUT
Description: XS-4104
Station Elevation Data num= 293

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.12	6.1	435.47	11.47	434.9	22.73	433.25	27.97	432.44
39.37	431.58	44.47	431.22	55.65	431.57	60.47	431.69	72.13	431.84
76.98	431.93	88.77	431.49	93.48	431.32	105.4	430.85	109.98	430.64
122.04	430.44	126.48	430.41	138.3	430.82	142.48	430.94	154.81	431.24
158.98	431.34	171.44	431.49	175.48	431.61	200.88	431.42	208.48	431.23
220.95	431.04	224.48	431.03	237.48	431.05	240.98	431.05	254.11	431.21
257.48	431.27	270.75	431.72	273.98	431.74	287.38	432.73	290.48	432.82
303.6	431.55	306.48	431.45	320.15	432.1	322.98	432.18	336.78	432.15
339.48	432.18	353.42	431.89	355.98	431.88	370.05	431.79	372.48	431.78
386.25	431.95	388.48	431.95	402.82	432.01	404.99	432.02	419.45	432.09
421.49	432.12	436.09	432.1	437.99	432.07	452.72	432.19	454.49	432.21
468.9	432.22	470.49	432.24	485.49	432.2	486.99	432.19	502.12	431.97
503.49	431.96	518.76	431.97	519.99	431.96	535.39	431.94	536.49	431.94
551.55	431.93	552.49	431.93	568.16	432.07	568.99	432.08	584.79	432.42
585.49	432.43	601.43	432.73	601.99	432.75	618.06	432.93	618.49	432.94
634.2	433.16	634.49	433.17	650.83	433.59	650.99	433.59	667.46	434.16
667.49	434.16	671.36	434.2	683.99	434.31	684.1	434.31	700.49	434.37
700.72	434.37	716.5	434.17	716.86	434.16	733	434.09	733.49	434.09
749.5	434.03	750.12	434.04	766	434.14	766.76	434.13	782.5	433.84
783.36	433.83	798.5	433.75	799.52	433.75	815	433.8	816.15	433.81
831.5	433.96	832.78	433.94	848	433.99	856.81	433.95	946.5	433.14
948.64	433.11	962.5	432.99	964.84	432.99	979	433.02	981.47	433.01
995.5	433	998.1	433.03	1005.03	433.11	1052.01	433.71	1057.95	433.79
1061.01	433.86	1064.13	433.84	1077.51	433.8	1080.76	433.77	1094.01	433.77
1107.04	436.09	1113.92	436.88	1126.51	437.36	1130.16	437.55	1143.01	438.42
1146.79	438.58	1159.51	439.34	1163.42	439.31	1176.01	439.06	1180.06	439.09
1192.51	439.05	1196.56	439.19	1208.51	439.67	1212.82	439.85	1225.01	440.01
1229.45	440.13	1241.51	440.09	1253.38	439.93	1258.01	439.68	1272.1	439.69
1279.2	439.64	1290.51	439.66	1295.48	439.51	1307.01	439.11	1313	438.94
1334.2	435.02	1353	428.75	1403	428.75	1405.1	429.45	1408	429.52
1419	431.98	1431	432.73	1432.19	432.35	1441.17	432.81	1442.17	432.82
1447.4	432.9	1453.13	433.02	1462.22	433.19	1465.07	433.25	1466.9	433.27
1476.78	433.35	1485.81	433.43	1488.5	433.47	1492.72	433.52	1500.44	433.63
1505.31	433.67	1512.41	433.75	1523.68	433.91	1524.37	433.92	1524.81	433.92
1536.34	434.08	1544.3	434.1	1548.3	434.11	1554.65	434.19	1560.23	434.27
1563.8	434.33	1571.97	434.45	1582.71	434.57	1583.66	434.57	1585.15	434.59
1595.62	434.7	1602.21	434.76	1607.58	434.8	1616.12	434.89	1619.53	434.92
1621.71	434.95	1631.42	435.06	1641.2	435.13	1643.31	435.14	1646.62	435.17
1655.26	435.25	1660.7	435.31	1667.1	435.39	1677.58	435.52	1678.84	435.53
1679.61	435.54	1690.79	435.62	1699.11	435.69	1702.76	435.72	1708.55	435.79
1714.68	435.88	1718.61	435.91	1726.58	435.99	1738.1	436.07	1738.47	436.07
1739.05	436.07	1750.43	436.18	1757.6	436.23	1762.31	436.25	1770.02	436.29
1774.02	436.31	1776.51	436.33	1785.87	436.34	1796.01	436.28	1797.77	436.3
1800.52	436.31	1809.71	436.39	1815.51	436.42	1821.68	436.52	1831.48	436.73
1833.64	436.78	1835	436.8	1845.61	436.96	1854.5	437.08	1857.52	437.13
1862.45	437.2	1869.22	437.28	1873.41	437.37	1881.03	437.5	1892.91	437.6
1892.92	437.6	1892.95	437.6	1904.89	437.81	1912.41	437.9	1916.85	437.95
1923.92	438.04	1928.79	438.1	1931.9	438.17	1940.68	438.35	1951.4	438.4
1952.56	438.42	1954.42	438.44	1964.28	438.57	1970.31	438.61	1976.13	438.66
1985.38	438.75	1988.1	438.78	1989.81	438.81	2000.06	438.94	2009.31	439.06
2012.03	439.09	2016.35	439.11	2023.95	439.16	2028.8	439.21	2035.84	439.34
2046.85	439.53	2047.74	439.54	2048.3	439.55	2059.49	439.81	2067.21	439.95
2071.31	439.98	2077.82	440.09	2083.24	440.19	2086.71	440.25	2095.13	440.39
2106.21	440.59	2107.03	440.61	2108.32	440.67	2118.99	441.06	2125.7	441.4
2130.95	441.5	2139.28	441.65	2142.92	441.72	2145.2	441.76	2154.7	441.89
2164.11	442.07	2166.48	442.13	2170.25	442.26	2178.4	442.54	2183.61	442.79
2190.29	443.04	2200.75	443.27	2202.19	443.31	2203.1	443.38	2214.16	444.45
2222.6	445.58	2226.12	445.89	2231.72	446.62	2238.05	447.2	2242.1	447.27
2249.8	447.34	2261.01	447.46	2261.42	447.47				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1334.2	.013	1419	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1334.2	1419	650	507	490	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
0	1229	440

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3597

INPUT

Description: XS-3597

Station Elevation Data num= 405

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.05	6.13	435.53	12.12	435.04	22.3	432.82	28.63	431.64
38.46	430.65	45.13	429.97	54.63	430.56	61.63	430.86	70.52	431.18
77.64	431.32	86.46	431.25	94.14	431.17	102.63	431.06	110.64	430.97
118.79	431.07	127.15	431.14	134.96	431.24	143.65	431.34	150.9	431.36
159.66	431.37	166.8	431.34	176.16	431.43	182.96	431.43	192.66	431.47
199.13	431.76	209.17	432.03	215.29	432.18	225.67	432.49	231.28	432.62
241.67	432.65	247.13	432.52	258.18	432.53	263.29	432.5	274.68	432.27
279.46	432.21	291.18	432.11	295.62	432.11	307.69	432.07	311.67	432.01
323.69	431.79	327.46	431.74	340.19	431.55	343.63	431.52	356.7	431.34
359.79	431.34	373.2	431.28	375.96	431.27	389.7	431.4	392.05	431.39
405.71	431.35	407.79	431.34	422.21	431.27	423.96	431.24	438.71	431.08
440.12	431.08	455.22	430.89	456.29	430.89	471.72	430.67	472.43	430.67
487.73	430.67	488.13	430.67	504.23	430.52	504.29	430.52	507.26	430.52
520.46	430.51	520.73	430.51	536.63	430.5	537.24	430.5	552.8	430.54
553.74	430.53	568.52	430.43	569.74	430.43	584.65	430.51	586.25	430.52
600.82	430.48	602.75	430.48	616.99	430.53	619.25	430.53	633.16	430.51
635.76	430.51	648.92	430.58	651.76	430.57	665	430.65	668.26	430.66
681.17	430.76	684.77	430.8	697.34	430.91	701.27	430.96	713.51	431.1
717.77	431.17	729.33	431.29	733.78	431.35	745.36	431.41	750.28	431.42
761.53	431.45	766.78	431.46	777.7	431.58	783.29	431.6	793.87	431.7
799.79	431.79	809.73	431.92	815.8	431.96	825.72	432.1	832.3	432.23
841.89	432.37	848.8	432.46	858.06	432.58	865.31	432.68	874.23	432.88
881.81	433.07	890.14	433.34	897.81	433.42	906.08	433.45	914.32	433.5
922.25	433.47	930.82	433.52	938.42	433.44	947.32	433.39	954.58	433.36
963.83	433.31	970.55	433.27	979.83	433.2	986.43	433.15	996.33	433.08
1002.6	433.05	1012.84	433.02	1018.77	433.03	1029.34	433.02	1034.94	433.03
1045.84	432.99	1050.96	432.89	1061.85	432.73	1066.79	432.66	1078.35	432.54
1082.96	432.55	1094.85	432.56	1099.13	432.56	1111.36	432.58	1115.3	432.51
1127.86	432.44	1131.36	432.46	1143.87	432.4	1147.15	432.4	1160.37	432.39
1163.32	432.38	1176.87	432.35	1179.49	432.35	1193.38	432.34	1195.66	432.35
1209.88	432.6	1211.77	432.61	1225.88	432.74	1227.51	432.74	1242.39	432.72
1243.68	432.7	1258.89	432.78	1259.84	432.77	1275.39	432.94	1276.01	432.94
1306.07	432.53	1307.86	432.51	1307.9	432.5	1324.03	432.6	1324.4	432.57
1340.2	432.67	1340.91	432.68	1356.37	432.85	1357.41	432.85	1372.54	432.64
1373.91	432.63	1388.27	432.57	1397.73	432.59	1413	427.5	1463	427.5
1483.61	434.37	1502.16	433.84	1503.02	433.83	1504.92	433.79	1519.28	433.9
1521.42	433.92	1535.54	434.54	1537.92	434.63	1551.38	434.57	1553.93	434.56
1567.56	434.18	1570.43	434.09	1583.82	434.09	1586.93	434.1	1600.07	434.36
1603.43	434.44	1616.33	434.54	1619.93	434.57	1632.21	434.35	1635.94	434.33
1648.35	434.39	1651.86	434.41	1652.55	434.42	1661.2	434.64	1672.3	434.73
1673.12	434.72	1674.35	434.72	1684.96	434.67	1692.05	434.66	1696.8	434.57
1703.92	434.42	1708.67	434.31	1711.8	434.25	1720.42	434.25	1730.96	434.29
1732.14	434.31	1733.93	434.32	1743.99	434.39	1750.71	434.53	1755.83	434.63
1763.5	434.73	1767.7	434.8	1770.46	434.85	1779.61	434.84	1790.21	434.78
1791.52	434.77	1793.51	434.76	1803.44	434.71	1809.96	434.67	1815.25	434.76
1823.53	434.87	1826.92	434.92	1829.12	434.93	1838.72	435.02	1848.87	435.12
1850.56	435.1	1853.09	435.07	1862.46	434.95	1868.62	434.9	1874.37	434.83
1883.11	434.71	1886.26	434.67	1888.37	434.65	1898.11	434.61	1908.12	434.55
1909.91	434.55	1912.68	434.57	1921.59	434.61	1927.28	434.65	1933.39	434.72
1942.69	434.81	1945.31	434.83	1947.03	434.85	1957.22	434.88	1966.78	434.9
1969.13	434.91	1972.71	434.9	1981	434.89	1986.53	434.89	1992.84	434.88
2002.27	434.87	2004.69	434.86	2006.28	434.86	2016.41	434.89	2025.44	434.86
2028.16	434.85	2032.29	434.83	2040.02	434.78	2045.19	434.75	2051.86	434.71
2061.85	434.68	2063.71	434.68	2064.94	434.67	2075.63	434.65	2084.69	434.62
2087.54	434.62	2091.87	434.6	2099.45	434.58	2104.44	434.53	2111.24	434.54
2121.89	434.52	2122.92	434.52	2123.59	434.51	2134.75	434.5	2143.35	434.43
2146.59	434.42	2151.45	434.47	2158.48	434.55	2163.1	434.55	2170.39	434.55
2181.47	434.64	2182.3	434.65	2182.85	434.65	2194.14	435.03	2202.6	434.89
2205.91	434.74	2211.03	434.85	2217.58	434.83	2221.75	434.88	2229.41	434.66
2241.05	434.54	2241.32	434.53	2241.5	434.52	2253.24	433.77	2261.26	432.99
2265.15	432.78	2271.07	432.43	2277.03	432.11	2281.01	431.99	2288.87	431.79
2300.63	431.53	2300.71	431.53	2300.76	431.53	2312.4	431.59	2319.91	431.32
2324.17	431.36	2330.65	431.32	2336.05	431.71	2339.66	431.85	2347.89	432.05
2359.42	432.97	2359.73	432.99	2360.21	433.02	2371.64	433.41	2379.17	433.94
2383.56	434.05	2390.23	434.18	2395.47	434.01	2398.92	434.12	2407.23	434.33
2418.07	434.78	2418.93	434.83	2420.25	434.88	2430.78	434.97	2437.82	435.14
2442.62	435.22	2449.81	435.43	2454.49	435.52	2457.57	435.63	2466.41	435.74
2477.33	435.98	2478.32	435.95	2479.83	435.9	2490.17	435.42	2497.08	435.28
2501.92	435.27	2509.39	435.21	2513.57	435.16	2516.23	435.14	2525.43	435.16
2535.98	435.19	2537.34	435.18	2539.41	435.18	2549.26	435.19	2555.73	435.17
2561.17	435.19	2569.43	435.15	2573.06	435.15	2575.49	435.15	2584.9	435.37
2595.24	435.58	2596.71	435.6	2598.99	435.66	2608.39	435.93	2614.39	435.97
2620.19	435.98	2629.01	436.09	2632.09	436.13	2634.14	436.16	2643.93	436.19
2653.89	436.19	2655.77	436.2	2658.57	436.21	2667.66	436.21	2673.65	436.27
2679.57	436.36	2688.59	436.46	2691.49	436.49	2693.4	436.54	2703.21	436.89
2712.55	437.03	2714.95	437.11	2718.6	437.24	2726.81	437.6	2732.3	437.71
2738.66	437.86	2748.17	438.29	2750.51	438.4	2752.05	438.44	2762.42	438.55
2771.8	438.75	2774.34	438.78	2778.18	438.84	2786.2	438.89	2791.56	438.95
2797.92	439.02	2807.75	439.11	2809.56	439.14	2810.71	439.17	2821.45	439.34
2830.46	439.6	2833.36	439.69	2837.77	439.74	2845.27	439.85	2850.21	439.93
2857.19	440.1	2867.78	440.27	2869.09	440.3	2869.96	440.32	2875.28	440.48

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1397.73	.013	1483.61	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1397.73	1483.61	510	499	584	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1356	432.9	1484	2875.28	434.8

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3098

INPUT
Description: XS-3098
Station Elevation Data num= 426

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.2	1.24	436.13	14.84	434.22	17.24	433.89	31.14	431.7
33.74	431.33	47.51	429.83	50.24	429.45	63.89	430.18	66.74	430.35
80.26	430.92	83.24	431.05	96.23	431.18	99.24	431.22	112.51	430.73
115.74	430.64	128.88	430.51	132.24	430.46	145.26	430.79	148.74	430.87
165.24	431.1	177.62	431.14	181.24	431.14	193.88	431.19	197.74	431.2
210.25	431.27	226.63	431.39	230.74	431.43	243	431.49	247.24	431.56
259.01	431.53	263.24	431.51	275.25	431.39	279.74	431.31	291.62	431.34
308	431.42	312.74	431.43	324.37	431.36	329.24	431.34	345.25	431.24
372.99	430.99	378.25	430.92	394.75	431.01	405.74	431.14	411.25	431.23
421.79	431.33	427.25	431.35	437.99	431.34	443.75	431.37	454.36	431.51
460.25	431.56	487.11	431.54	493.25	431.52	503.17	431.64	509.25	431.74
525.75	431.76	542.25	431.89	552.11	431.88	558.75	431.91	568.48	431.99
575.25	432.07	584.56	432.12	591.25	432.17	607.75	432.02	617.1	432.05
624.25	432.03	640.75	432.15	657.25	432.14	665.95	432.11	673.26	432.11
682.1	432.09	689.76	432.05	698.47	432.17	706.26	432.31	714.85	432.39
722.76	432.41	739.26	432.4	755.26	432.36	771.76	432.49	779.84	432.5
788.26	432.49	796.22	432.56	804.76	432.57	812.59	432.65	821.26	432.83
837.26	432.7	844.84	432.66	853.76	432.54	861.21	432.48	870.26	432.53
886.76	432.45	893.96	432.45	903.26	432.4	910.12	432.46	919.26	432.52
926.21	432.55	942.58	432.52	952.26	432.54	958.96	432.53	975.33	432.44
985.26	432.43	991.51	432.46	1001.27	432.47	1007.58	432.52	1017.77	432.56
1023.95	432.56	1040.33	432.63	1050.77	432.76	1056.66	432.94	1059.61	433.39
1072.96	434.33	1080.36	434.32	1102.72	435.18	1109.42	435.54	1137.67	435.54
1143.71	435.47	1238.36	434.69	1261.77	434.41	1334.36	433.31	1336.06	433.21
1339.39	433.02	1345.78	433.39	1355	433	1383.82	431.98	1395.9	427.95
1401.24	426.24	1405.69	426.25	1451	426.25	1473.14	433.63	1477.28	433.77
1481.4	433.77	1491.62	433.83	1493.44	433.85	1496.12	433.83	1508.59	433.63
1521.06	433.5	1529.67	433.53	1533.52	433.64	1545.97	433.82	1547.79	433.85
1565.9	434.01	1581.38	433.82	1582.83	433.8	1583.47	433.79	1595.28	433.72
1601.59	433.67	1607.75	433.78	1619.7	433.95	1620.21	433.95	1637.82	434.12
1645.03	434.1	1655.93	434.11	1660.71	434.08	1669.6	434.01	1673.5	433.97
1691.62	434.33	1706.91	434.28	1709.73	434.3	1727.85	433.99	1731.84	434.01
1740.64	433.89	1744.29	433.88	1745.96	433.86	1756.47	434.13	1763.53	434.13
1768.72	434.23	1780.01	434.69	1781.14	434.73	1781.65	434.74	1793.6	434.85
1799.76	434.98	1806.07	434.94	1830.95	434.91	1835.99	434.93	1843.2	434.93
1853.56	434.97	1855.38	434.97	1859.34	434.95	1867.83	434.88	1871.68	434.88
1892.76	434.8	1899.31	434.84	1905.22	434.86	1907.91	434.86	1917.69	434.91
1926.02	435.01	1930.07	435.03	1939.27	435.05	1954.64	435.06	1961.71	435.04
1967.04	435.07	1979.82	435.07	1991.92	435.03	1997.94	435.06	2004.38	435.06
2016.05	434.89	2016.83	434.89	2018.6	434.9	2033.62	435.02	2041.29	434.96
2051.74	434.84	2066.15	434.7	2078.61	434.5	2087.97	434.32	2091.08	434.28
2097.94	434.25	2103.54	434.21	2106.08	434.21	2115.8	434.27	2123.65	434.28
2128.1	434.35	2140.55	434.49	2141.77	434.51	2152.96	434.65	2159.88	434.68
2177.27	434.84	2177.77	434.85	2178	434.85	2196.11	435.05	2202.56	435.09
2213.68	435.13	2227.21	435.12	2231.8	434.94	2239.61	434.9	2249.91	435.05
2252.02	435.04	2264.46	435.59	2268.03	435.65	2286.14	435.6	2289.33	435.56
2296.56	435.52	2301.53	435.46	2303.71	435.46	2313.95	435.42	2321.83	435.49
2326.41	435.5	2338.87	435.33	2339.94	435.33	2351.27	435.4	2358.06	435.37
2363.68	435.44	2375.9	435.51	2376.17	435.51	2388.29	435.55	2393.74	435.58
2411.86	435.44	2413.11	435.41	2415.86	435.37	2429.97	435.11	2437.93	435.05
2448.09	435.15	2450.34	435.16	2455.23	435.17	2466.2	435.21	2487.33	435.38
2512.26	435.47	2520	435.44	2524.73	435.43	2535.16	435.35	2537.19	435.34
2538.12	435.34	2549.59	435.5	2556.23	435.62	2573.8	435.73	2574.03	435.73
2574.52	435.72	2586.49	435.61	2591.92	435.58	2598.96	435.6	2614.49	435.6
2623.84	435.58	2628.15	435.62	2636.25	435.81	2646.26	435.91	2648.61	435.9
2653.85	435.96	2660.78	436.02	2663.83	436.06	2673.18	436.04	2681.95	435.98
2685.65	435.97	2698.12	435.9	2700.06	435.88	2710.58	435.85	2718.18	435.85
2723.05	435.81	2733.79	435.76	2735.5	435.75	2736.29	435.74	2747.67	435.54
2753.86	435.48	2759.94	435.38	2771.98	435.29	2773.15	435.29	2784.81	435.18
2797.27	435.04	2808.21	434.89	2809.74	434.88	2813.12	434.89	2826.32	434.9
2834.4	434.93	2843.89	434.94	2846.6	434.93	2852.48	434.96	2859.04	434.98
2862.01	434.97	2871.5	434.96	2880.12	434.98	2892.45	435.04	2896.43	435.05
2898.24	435.07	2916.35	434.77	2921.26	434.68	2932.42	434.52	2933.46	434.51
2933.92	434.5	2952.04	434.55	2958.26	434.65	2970.15	434.77	2970.67	434.78
2971.78	434.79	2983.13	434.92	2988.27	434.96	3006.38	435.2	3008.02	435.23
3020.19	435.49	3023.95	435.6	3032.51	435.77	3042.07	436	3057.35	436.25
3060.18	436.29	3069.82	436.4	3078.3	436.52	3082.28	436.55	3094.75	436.71
3096.41	436.72	3106.99	436.82	3113.98	436.87	3119.3	436.95	3131.05	437.16
3131.77	437.17	3132.1	437.17	3144.17	437.48	3156.58	437.82	3168.98	438.19
3170.41	438.23	3181.44	438.58	3186.44	438.69	3204.01	438.93	3206	438.94
3218.42	439.05	3222.13	439.04	3230.83	438.94	3240.24	438.92	3243.24	438.88

3255.67	438.66	3258.36	438.62	3268.14	438.74	3276.47	438.63	3280.52	438.6
3292.72	438.53	3294.04	438.5	3305.16	438.37	3317.62	438.27	3329.68	438.43
3330.09	438.44	3330.27	438.44	3342.49	438.29	3348.39	438.29	3354.9	438.2
3366.5	438.23	3367.29	438.22	3369.04	438.21	3379.48	438.13	3384.07	438.13
3391.85	438.2	3402.19	438.16	3404.31	438.16	3409.01	438.05	3416.74	437.93
3420.3	437.54	3429.15	436.75	3438.42	436.43	3441.55	436.19	3448.37	436.12
3453.99	436.01	3456.53	435.89	3466.25	435.51	3474.1	435.3	3478.54	435.31
3488.34	435.44	3491.01	435.47	3492.22	435.49	3503.47	435.78	3510.33	435.97
3528.31	436.64	3528.45	436.65	3546.56	437.43	3553.08	437.7	3564.13	438.28
3565.25	438.32	3577.7	438.98	3582.25	439.5	3590.17	440.53	3600.36	442.08
3602.63	442.5	3607.64	443.56	3615.06	445.11	3618.48	446.45	3627.47	450.49
3636.59	453.78	3639.81	454.45	3647	456.64	3651.97	458.03	3654.16	458.45
3664.39	460.21	3672.28	461.27	3676.86	462	3686.97	464.12	3689.32	464.59
3689.76	464.7	3694.09	466.39	3696.83	466.8	3697.34	466.76	3697.71	466.72
3698.35	466.71								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1383.82	.013	1473.14	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1383.82	1473.14	690	501	980	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1102	435	1474	3698.35	433.7

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2597

INPUT
Description:
Station Elevation Data num= 465

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.14	14.23	434.39	20.54	433.81	40.1	432.6	41.54	432.48
46.53	432.01	62.22	430.48	66.77	430.13	83.22	430.09	93.45	430.04
103.9	430.21	120.12	430.24	124.9	430.22	145.9	430.39	146.8	430.4
166.58	430.56	172.66	430.62	187.58	430.95	191.94	431.07	196.52	431.22
200.27	431.29	213.03	431.64	217.35	431.7	229.54	431.98	234.43	432.1
246.05	432.16	251.33	432.15	262.05	432.25	268.06	432.32	278.56	432.34
295.07	432.13	302.22	432.09	311.58	432.22	319.29	432.26	328.09	432.17
336.11	432.21	352.93	432.19	360.61	432.2	377.12	432.35	404.16	432.44
410.13	432.41	420.89	432.54	426.14	432.53	437.8	432.46	442.65	432.49
454.88	432.4	471.95	432.36	475.67	432.38	489.03	432.4	492.18	432.4
505.67	432.54	508.19	432.55	522.67	432.59	524.69	432.6	539.74	432.79
541.2	432.8	556.82	433.16	557.71	433.17	573.9	433.06	574.22	433.06
590.23	433.21	590.45	433.21	606.74	433.52	607.52	433.52	623.25	433.44
624.59	433.45	639.76	433.3	641.66	433.32	656.27	433.55	658.65	433.55
672.27	433.68	675.28	433.65	688.78	433.38	709.41	433.26	721.8	433.37
726.48	433.36	743.39	433.22	754.32	433.11	760.1	433.13	770.83	433.15
777.17	433.14	787.34	433.18	794.24	433.18	803.84	433.26	811.3	433.23
836.36	433.07	844.92	432.99	852.87	432.94	869.38	432.77	879.06	432.77
885.89	432.74	896.13	432.79	902.4	432.7	912.86	432.85	918.41	433.03
929.75	432.99	934.91	432.98	946.81	432.93	951.42	432.96	963.88	432.89
980.95	432.72	984.44	432.7	997.59	432.65	1000.45	432.65	1014.57	432.73
1016.96	432.72	1031.64	432.6	1048.71	432.5	1049.98	432.49	1065.77	432.58
1066.49	432.58	1082.33	432.7	1082.49	432.71	1099	432.64	1099.39	432.64
1115.51	432.46	1116.46	432.47	1132.02	432.76	1133.53	432.77	1148.53	432.85
1150.53	432.85	1164.54	432.87	1167.15	432.91	1181.05	433.01	1184.22	433.05
1197.56	433.42	1230.57	433.74	1246.58	433.93	1251.97	433.97	1263.09	434.1
1269.04	434.21	1279.6	434.32	1286.11	434.2	1296.11	434.13	1303.18	433.99
1312.62	433.9	1328.63	433.95	1345.14	434.16	1353.86	434.38	1370.93	434.51
1378.15	434.58	1388	434.48	1394.66	434.39	1404.74	434.4	1410.67	434.47
1421.62	433.65	1434	433.09	1438.49	432.17	1460	425	1510	425
1532.37	432.46	1533	432.48	1542.23	432.61	1557.18	432.77	1558.74	432.79
1573.54	432.65	1574.74	432.64	1590.23	432.57	1591.24	432.56	1606.95	432.63
1607.74	432.63	1623.67	432.72	1624.24	432.72	1640.39	432.83	1640.74	432.83
1656.62	432.85	1673.25	432.83	1673.34	432.83	1689.75	432.9	1690.06	432.9
1706.25	432.95	1706.79	432.95	1722.75	432.82	1723.49	432.82	1738.75	432.8
1739.73	432.79	1755.25	432.7	1756.46	432.7	1771.76	432.6	1773.19	432.57
1788.26	432.49	1795.72	432.49	1800.41	432.5	1804.02	432.5	1805.42	432.51
1816.51	432.57	1829.11	432.67	1841.85	432.74	1845.82	432.77	1854.59	432.86
1858.02	432.86	1875.73	432.94	1880.08	432.99	1891.22	433.1	1892.81	433.12
1893.44	433.12	1905.23	433.26	1910.61	433.3	1917.8	433.33	1928.32	433.31
1930.48	433.3	1943.2	433.3	1955.94	433.44	1963.75	433.46	1981.34	433.3
1981.46	433.3	1993.83	433.24	2016.34	433.36	2019.1	433.36	2026.05	433.57
2031.81	433.68	2034.05	433.74	2044.55	433.95	2051.76	434.13	2057.29	434.18
2069.48	434.31	2070.02	434.29	2071.46	434.24	2082.48	433.77	2086.65	433.63
2095.13	433.46	2104.36	433.07	2107.87	432.98	2120.59	432.97	2122.07	432.96
2123.93	432.9	2125.4	432.88	2168.32	431.7	2181.53	431.68	2197.44	431.53
2246.91	431.46	2297.1	431.03	2297.82	431.01	2298.11	431.01	2310.56	431.12
2315.82	431.18	2323.31	431.12	2333.53	431.18	2335.99	431.16	2342.5	431.21
2348.43	431.22	2350.7	431.21	2361.06	431.14	2373.75	431.15	2386.12	431.12
2387.22	431.12	2399.17	431.08	2403.84	431.01	2411.91	430.99	2421.55	431.1
2424.59	431.11	2432.62	431.25	2437.03	431.32	2438.72	431.3	2449.68	431.71
2456.43	431.73	2462.26	431.67	2487.78	430.84	2491.85	430.94	2500.52	431.03

2509.56	430.99	2513.18	430.95	2522.74	430.8	2525.64	430.76	2526.74	430.75
2538.36	430.5	2544.45	430.45	2562.16	430.4	2563.84	430.4	2568.14	430.42
2576.54	430.43	2589.23	430.58	2601.82	430.63	2614.76	430.62	2626.96	430.68
2632.47	430.77	2639.71	430.84	2650.18	430.92	2652.45	430.95	2658.26	431.07
2665.16	431.18	2667.89	431.21	2677.84	431.27	2685.6	431.34	2690.42	431.37
2702.77	431.56	2702.98	431.56	2728.31	431.68	2748.38	431.62	2755.91	431.62
2773.62	431.65	2779.15	431.67	2790.79	431.68	2791.63	431.69	2793.78	431.7
2808.5	431.82	2817.01	431.87	2826.21	431.88	2829.7	431.89	2842.4	431.86
2843.92	431.87	2861.64	431.93	2867.75	431.99	2880.24	432.25	2892.94	432.4
2896.52	432.45	2918.31	432.49	2928.62	432.56	2931.01	432.58	2931.94	432.59
2943.75	432.67	2966.83	432.75	2968.85	432.79	2974.02	432.84	2981.59	432.95
2984.54	432.95	2994.33	432.97	3002.25	432.96	3007.07	432.99	3019.43	432.94
3019.96	432.94	3032.5	432.91	3037.67	432.91	3045.02	432.69	3054.85	432.45
3057.48	432.39	3064.14	432.19	3070.2	432.03	3078.01	431.98	3096.66	432.03
3106.98	432.18	3107.98	432.19	3121.11	432.19	3125.69	432.07	3133.62	431.92
3142.86	431.98	3146.1	432.06	3154.26	431.96	3158.8	431.92	3160.57	431.93
3171.54	431.96	3178.29	432.09	3184.28	431.96	3196	431.8	3199.66	431.69
3209.77	431.41	3213.71	431.33	3222.31	431.27	3230.88	430.99	3234.86	431.02
3245.07	431	3247.59	431.02	3248.59	431	3260.28	431.35	3266.3	431.33
3272.96	431.35	3284.01	431.64	3285.65	431.68	3289.78	431.81	3298.37	432.02
3301.72	432.12	3310.91	432.12	3318.9	432.24	3323.47	432.22	3335.19	432.31
3336.21	432.32	3337.54	432.32	3372.03	432.35	3374.26	432.34	3379.9	432.3
3386.98	432.23	3389.74	432.22	3399.5	432.15	3406.92	432.12	3412.08	432.08
3424.63	431.93	3424.82	431.93	3425.3	431.92	3442.34	431.81	3450.3	431.78
3460.05	431.77	3463.04	431.76	3488.21	432.14	3494.93	432.25	3500.75	432.27
3512.64	432.24	3513.43	432.24	3515.42	432.27	3526.16	432.39	3530.35	432.46
3538.91	432.64	3548.07	432.73	3556.99	432.78	3560.83	432.81	3638.52	433.16
3640.25	433.16	3650.94	433.18	3652.99	433.19	3665.47	433.19	3670.97	433.22
3688.68	433.2	3690.83	433.21	3703.54	433.38	3706.39	433.43	3716.23	433.67
3724.1	433.79	3741.06	434.01	3741.81	434.01	3758.99	434.14	3766.7	434.17
3776.7	434.3	3786.47	434.48	3792.16	434.56	3794.41	434.57	3804.84	434.72
3812.12	434.67	3817.53	434.57	3830.21	434.56	3831.18	434.57	3842.66	434.63
3855.31	434.71	3864.71	434.74	3868.05	434.71	3876.59	434.41	3880.79	434.29
3882.43	434.19	3893.53	433.42	3900.14	432.95	3906.27	432.72	3917.85	432.66
3918.98	432.71	3921.99	432.99	3931.41	433.94	3935.02	434.24	3944.01	434.97
3952.73	435.27	3956.7	435.38	3966.71	436.05	3969.39	436.2	3970.44	436.29
3982.14	436.81	3988.15	437.36	3994.88	438.09	4005.87	439.54	4007.58	439.88
4012.11	440.56	4020.01	441.91	4023.04	442.56	4032.62	444.75	4040.75	446.25
4045.31	446.94	4056.82	448.58	4058	448.75	4058.46	448.81	4076.17	453.01
4093.88	455.59	4096.17	456	4111.06	458.83	4121.32	460.43	4128.77	461.29
4134.06	462.15	4146.48	463.12	4146.8	463.16	4147.63	463.04	4154.29	461.97

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1434	.013	1532.37	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1434	1532.37	760	500	410	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1370	434.5	2069	4154.29	434.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2097

INPUT
Description: XS-2097
Station Elevation Data num= 441

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.08	8.65	435.23	17.96	434.13	25.15	432.93	34.18	431.92
41.65	430.74	50.14	430.13	57.66	429.98	66.13	430.05	74.16	430.38
82.36	430.39	90.66	430.57	123.67	430.48	130.81	430.64	139.67	431.04
146.76	431.27	156.17	431.65	162.98	431.74	172.67	431.83	179.2	432.02
189.18	432.13	195.43	432.42	205.68	432.92	211.47	433.17	221.68	433.58
238.18	433.96	243.6	434.03	254.68	434.11	266.15	434.14	276.05	434.37
287.69	434.39	292.14	434.24	303.69	434.21	308.01	434.18	320.19	434.23
324.23	434.21	336.7	434.17	340.45	434.18	353.2	434.24	356.68	434.24
372.8	434.13	385.7	434.12	388.63	434.1	402.21	434.06	421.08	434.19
437.3	434.29	451.71	434.4	453.47	434.4	484.22	434.59	517.92	434.59
533.72	434.65	549.73	434.67	599.23	434.65	630.56	434.71	648.24	434.71
664.74	434.93	679.2	435.01	681.25	435.03	695.43	434.85	697.75	434.83
713.75	434.55	727.39	434.58	730.25	434.57	746.76	434.62	763.26	434.55
776.08	434.43	779.76	434.41	791.93	434.37	795.76	434.35	812.26	434.34
824.27	434.48	828.77	434.54	840.49	434.6	845.27	434.64	861.77	434.69
872.62	434.68	877.77	434.65	888.68	434.67	921.14	434.62	927.28	434.63
937.37	434.58	953.3	434.32	959.79	434.26	969.33	434.23	976.29	434.19
985.56	434.17	992.79	434.13	1009.29	433.83	1018.01	433.69	1033.99	433.51
1041.8	433.52	1049.97	433.5	1074.8	433.18	1082.43	433.2	1091.3	433.18
1107.81	433.26	1114.67	433.27	1123.81	433.23	1130.62	433.24	1140.31	433.17
1146.85	433.14	1156.81	433.02	1163.07	432.99	1173.32	433.06	1179.3	433.13
1189.82	433.29	1195.36	433.36	1205.82	433.52	1211.26	433.57	1222.32	433.69
1227.49	433.76	1238.83	433.94	1243.72	433.97	1255.33	434.09	1259.95	434.09
1276.04	434.05	1287.83	434.08	1291.91	434.14	1304.34	434.28	1320.84	434.37
1324.36	434.36	1337.34	434.22	1340.59	434.15	1353.84	433.72	1369.84	433.17
1372.55	433.11	1386.35	432.92	1405.01	432.82	1419.35	432.78	1421.23	432.73

1437.41	432.24	1451.86	431.85	1453.2	431.83	1456	430.99	1478.79	430.82
1500	423.75	1500.08	423.75	1550	423.75	1574.63	431.96	1577.51	432.04
1578.18	432.09	1602.8	432.42	1614.27	432.5	1617.74	432.51	1631.67	432.5
1640.07	432.41	1652.64	432.45	1665.24	432.41	1678.22	432.41	1684.85	432.37
1691.2	432.36	1702.25	432.42	1704.14	432.42	1719.13	432.6	1729.83	432.71
1736.53	432.64	1742.86	432.52	1753.94	432.33	1755.89	432.31	1761.69	432.33
1768.92	432.34	1771.34	432.33	1781.95	432.23	1788.75	432.23	1794.84	432.26
1805.63	432.27	1823.03	432.1	1833.6	432.04	1840.44	431.96	1846.58	431.92
1857.84	431.96	1864.6	432.05	1875.25	432.24	1885.36	432.29	1892.12	432.24
1898.24	432.25	1909.53	432.32	1911.27	432.41	1916.45	432.49	1926.93	432.71
1937.25	433.05	1944.34	433.1	1950.23	432.9	1961.74	432.76	1967.51	432.65
1975.89	432.47	1978.62	432.46	1988.86	432.46	1996.03	432.4	2001.89	432.4
2013.43	432.38	2027.95	432.17	2030.83	432.15	2040.98	432.28	2048.24	432.31
2053.88	432.27	2065.12	432.26	2071.2	432.21	2079.64	432.12	2082.52	432.12
2092.62	432	2099.93	431.85	2105.6	431.66	2117.33	431.08	2118.59	431.06
2131.6	431.09	2134.74	431.09	2151.61	431.22	2157.27	431.3	2169.02	431.39
2170.3	431.41	2183.29	431.48	2203.83	431.48	2209.26	431.44	2221.23	431.39
2234.93	431.35	2238.11	431.35	2272.92	431.29	2290.33	431.24	2300.01	431.24
2307.73	431.2	2312.92	431.19	2324.61	431.24	2338.67	431.14	2351.65	431.08
2359.42	431.02	2364.63	431.01	2376.82	431.03	2390.63	431.11	2403.45	431.27
2416.3	431.32	2429.33	431.4	2442.32	431.3	2445.92	431.29	2463.32	431.27
2468.28	431.29	2481.25	431.28	2493.98	431.32	2497.6	431.38	2506.92	431.46
2532.41	431.58	2532.98	431.59	2546.01	431.6	2549.82	431.61	2559.04	431.67
2567.22	431.68	2584.1	431.75	2597.7	431.75	2601.5	431.71	2610.68	431.46
2636.31	431.28	2649.67	431.26	2653.72	431.29	2661.5	431.41	2685.2	431.52
2688.36	431.56	2701.35	431.89	2705.41	431.85	2714.33	431.71	2722.81	431.83
2727.31	431.82	2740.5	431.91	2765.95	431.73	2774.5	431.71	2791.68	431.79
2805.05	431.87	2817.88	431.75	2826.71	431.75	2831.01	431.74	2844.19	431.84
2861	431.92	2869.7	431.73	2895.81	431.69	2908.7	431.86	2913.21	431.93
2934.36	432.32	2947.1	432.44	2964.9	432.41	2973.35	432.38	2982.3	432.33
2999.71	432.13	3002.73	432.13	3025.99	432.1	3040.42	432.02	3050.01	432.11
3051.4	432.11	3064.08	431.77	3068.8	431.82	3077.11	431.96	3086.21	431.95
3101.85	432.01	3115.75	431.97	3120.49	432.02	3137.89	432.05	3152.91	430.66
3155.3	430.43	3172.7	430.43	3180.58	430.69	3189.58	430.88	3193.4	430.93
3206.99	431.26	3219.4	431.52	3224.39	431.57	3232.38	431.58	3245.36	431.53
3258.35	431.54	3259.2	431.53	3271.1	431.5	3276.08	431.48	3284.02	431.39
3307.67	431.48	3310.89	431.48	3323.11	431.45	3336.14	431.39	3345.7	431.28
3349.09	431.25	3359.52	431.3	3364.16	431.28	3379.98	431.17	3397.38	430.98
3400.74	430.92	3410.58	430.82	3414.79	430.8	3426.76	430.72	3432.19	430.6
3439.62	430.53	3449.07	430.59	3452.43	430.69	3462.42	430.63	3466.48	430.66
3478.43	430.83	3483.88	430.87	3504.39	431.13	3517.38	431.23	3518.69	431.26
3530.15	431.4	3535.57	431.45	3543.05	431.38	3552.97	431.33	3556.08	431.33
3565.33	431.26	3570.38	431.24	3587.78	431.26	3595.17	431.23	3605.19	431.23
3608.13	431.26	3620.85	431.3	3633.8	431.28	3639.47	431.35	3646.78	431.46
3656.88	431.47	3659.77	431.49	3674.28	431.5	3685.79	431.44	3698.66	431.31
3720.09	431.29	3725.97	431.3	3737.45	431.38	3743.37	431.38	3750.43	431.42
3760.78	431.43	3763.41	431.42	3776.41	431.48	3789.19	431.32	3812.46	431.12
3815.11	431.12	3847.27	431.25	3864.68	431.22	3879.89	431.14	3892.83	431.14
3898.96	431.2	3905.81	431.22	3918.79	431.23	3931.79	431.13	3933.77	431.1
3944.82	431.11	3951.18	431.14	3957.7	431.14	3968.05	431.18	3970.49	431.17
3983.5	431.16	3985.46	431.14	4020.27	431.04	4035.45	430.99	4037.67	430.97
4048.23	430.8	4061.11	430.73	4071.96	430.64	4074.14	430.63	4087.17	430.52
4089.36	430.48	4100.2	430.23	4106.77	430.2	4113.23	430.07	4124.17	430.96
4126.22	431.15	4132.5	431.34	4138.93	431.56	4141.05	431.73	4151.86	432.87
4158.45	433.11	4164.84	433.31	4177.82	433.54	4183.56	433.59	4193.26	433.69
4203.86	433.84	4210.67	433.96	4216.74	434.09	4229.52	434.39	4242.52	434.61
4244.95	434.69	4255.51	435.1	4262.35	435.52	4276.29	436.85	4279.76	437.1
4281.47	437.32	4286.47	438.22	4294.48	439.63	4297.16	440.18	4307.27	443
4314.04	444.8	4320.14	446.35	4331.45	449.13	4333.17	449.47	4346.2	452.36
4348.85	453.01	4359.23	455.1	4366.26	456.5	4372.27	457.89	4383.66	461
4385.26	461.53	4390.16	462.71	4397.96	464.72	4400.54	465.02	4410.88	465.76
4417.94	465.67	4423.86	465.02	4435.35	463.54	4436.84	463.33	4443.7	462.73
4444.4	462.77								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1478.79	.013	1574.63	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1478.79	1574.63	460	497	900	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1320	434.4	1944	4444.4	433.1

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1600

INPUT
Description:
Station Elevation Data num= 441

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.32	2.04	436.18	18.54	433.35	26.39	431.64	35.04	429.99
51.54	427.75	59.58	428.01	68.04	428.15	75.93	428.7	84.04	429.35
92.27	429.5	100.54	429.61	117.04	429.58	133.54	429.8	142.06	430.15
150.04	430.41	158.39	431.02	166.04	431.61	174.75	432.16	182.54	432.52

191.35	432.77	199.04	433.2	215.54	433.45	224.54	433.45	240.86	433.63
248.04	433.66	257.23	433.62	264.54	433.72	273.83	433.74	281.04	433.7
290.43	433.72	297.54	433.8	307.02	433.81	323.33	433.76	330.04	433.78
339.71	433.88	346.54	433.87	356.31	433.76	363.04	433.72	372.91	433.72
379.54	433.69	389.5	433.67	396.04	433.6	405.79	433.55	412.04	433.57
428.54	433.36	438.79	433.2	445.04	433.08	455.39	433.08	461.54	433.05
471.99	432.89	478.04	432.82	494.04	432.58	510.54	432.5	521.27	432.54
527.04	432.61	543.55	433.17	554.47	433.26	560.05	433.28	570.73	433.43
576.05	433.54	587.16	433.46	592.55	433.36	609.05	433.23	620.35	433.02
625.55	432.88	636.95	432.73	653.19	432.65	658.05	432.64	669.64	432.53
686.24	432.28	691.05	432.19	702.83	432.1	707.55	432.11	719.43	432.35
724.05	432.42	735.66	432.71	740.05	432.78	752.12	432.88	756.55	432.9
773.05	433.03	785.31	433.1	789.55	433.16	806.05	433.36	822.05	433.52
834.6	433.66	838.55	433.69	855.05	433.72	871.55	433.51	888.05	432.95
900.6	432.46	904.05	432.34	917.08	432.38	920.55	432.38	933.68	432.8
937.05	432.89	953.55	433.06	970.05	433.14	983.06	433.35	986.05	433.38
1002.55	433.62	1016.16	433.97	1019.05	434.02	1032.76	434.17	1035.55	434.22
1052.05	434.37	1068.05	434.41	1082.05	434.62	1101.05	434.99	1117.55	435.43
1131.84	435.66	1150.06	436.07	1166.56	436.22	1181.12	436.32	1183.06	436.35
1197.72	436.44	1214.32	436.56	1232.06	436.65	1249.82	436.68	1257.04	436.66
1270.87	436.66	1281.44	436.59	1287.05	436.57	1293.61	436.5	1305.99	436.44
1317.75	436.31	1323.71	436.28	1329.86	436.2	1341.65	436.16	1354.32	435.7
1360.93	435.39	1366.55	435.1	1379.54	434.22	1390.94	433.83	1398.16	433.57
1403	433.31	1412.43	432.97	1414.94	432.92	1427.14	433.02	1434.82	432.96
1439.37	432.86	1453.43	432.93	1463.75	432.67	1472.04	432.43	1475.91	432.4
1488.1	432.36	1490.65	432.37	1500.14	432.29	1508.7	432.33	1513.21	432.26
1525.28	432.14	1541.78	432.23	1546.64	432.22	1558.28	432.27	1561	432.48
1581	432.28	1596	428.55	1614	422.75	1664	422.75	1690.08	431.44
1696.86	431.4	1705.82	431.43	1713.19	431.64	1722.32	431.88	1731.63	431.57
1745.65	431.33	1764.47	431.33	1773.59	431.14	1784.61	431.08	1796.25	430.85
1804.89	430.7	1814.59	430.7	1821.26	430.8	1823.67	430.76	1830.71	430.85
1892.63	431.85	1907.82	431.88	1917.09	431.86	1930.3	431.92	1946.12	431.93
1952.96	431.97	1962.73	431.99	1985.47	432.14	1998.61	432.15	2010.7	432.17
2015.16	432.21	2036.17	432.24	2050.47	432.17	2061.74	432.25	2068.13	432.18
2073.63	432.17	2093.82	432.17	2099.83	432.13	2113.15	432.49	2121.19	432.64
2138.22	434.15	2155.87	434.61	2164.19	434.84	2173.53	435.08	2184.72	435.13
2188.83	435.26	2216.38	432.37	2263.44	432.45	2282.5	432.42	2293.34	432.43
2313.71	432.41	2331.37	432.25	2349.02	432.25	2366.15	432.02	2417.61	432.46
2419.12	432.48	2436.77	432.48	2459.36	431.97	2468.19	431.69	2471.55	431.69
2489.21	431.99	2493.76	432.04	2505.72	431.99	2506.86	432	2519.33	432.57
2524.52	432.52	2531.95	432.48	2541.64	432.52	2544.52	432.44	2552.07	432.4
2557.28	432.35	2570.01	432.33	2576.95	432.29	2594.61	432.45	2608.26	432.61
2620.85	432.63	2633.44	432.61	2647.04	432.67	2658.95	432.55	2671.68	432.55
2684.41	432.59	2697.18	432.54	2700.01	432.54	2709.74	432.49	2717.13	432.49
2722.36	432.45	2734.79	432.49	2760.72	432.46	2773.51	432.51	2787.76	432.5
2798.76	432.45	2811.36	432.45	2822.54	432.4	2836.86	432.37	2849.65	432.42
2862.43	432.45	2875.51	432.58	2887.67	432.61	2910.28	432.49	2920.11	432.4
2925.78	432.32	2927.94	432.32	2938.57	432.24	2951.35	432.2	2966.47	432.14
2976.62	432.08	2980.37	432.08	2998.03	432.14	3012.83	432.36	3027.62	432.64
3033.34	432.78	3046.78	432.62	3071.06	432.29	3103.1	432.6	3104.84	432.59
3118.47	432.26	3153.01	433.5	3154.4	433.61	3155.87	433.5	3169.84	433.33
3173.52	433.27	3187.7	432.66	3191.18	432.48	3196.85	432.51	3205.53	432.64
3208.84	432.64	3218.32	432.7	3226.49	432.77	3256.23	432.79	3261.27	432.85
3268.96	432.74	3278.93	432.77	3288.86	432.76	3294.45	432.73	3296.58	432.64
3307.24	432.53	3314.24	432.57	3319.9	432.49	3331.36	432.46	3335.21	432.47
3345.17	432.57	3349.02	432.55	3357.9	432.64	3370.63	432.66	3384.33	432.83
3396.16	432.86	3408.79	432.96	3419.11	433.96	3421.35	433.99	3427.22	435.43
3434.13	436.92	3436.76	436.92	3439.03	436.43	3442.71	436.27	3485.01	433.43
3492.47	433.07	3506.85	433.07	3524.51	432.99	3535.84	433.06	3542.17	433.03
3559.82	433.09	3565.59	432.99	3577.48	432.7	3586.69	432.51	3594.6	432.48
3599.24	432.54	3611.24	432.66	3629.91	433.02	3647.57	433.2	3650.34	433.25
3663.12	433.36	3675.67	433.34	3682.35	433.31	3688.31	433.31	3700	433.38
3717.66	433.44	3735.32	433.47	3739.3	433.5	3752.97	433.54	3764.57	433.5
3770.09	433.54	3777.23	433.55	3790.02	433.43	3795.96	433.43	3805.41	433.39
3823.06	433.33	3828.24	433.39	3841.62	433.35	3853.46	433.41	3857.84	433.41
3875.5	433.24	3887.97	433.26	3904.51	433.3	3917.3	433.38	3928.47	433.4
3934.33	433.35	3945.59	433.22	3955.18	433.03	3963.24	432.94	3980.9	432.88
3993.43	432.93	4006.22	433.03	4026.34	433.1	4031.43	433.11	4044.11	433.22
4056.85	433.25	4068.65	433.24	4082.35	433.14	4086.3	433.13	4103.96	433.24
4121.08	433.3	4133.11	433.31	4158.68	433.12	4171.44	433.08	4174.05	433.06
4184.17	433.1	4191.71	433.16	4196.79	433.22	4208.83	433.33	4222.03	433.4
4226.48	433.38	4234.82	433.44	4247.61	433.38	4261.79	433.35	4273.11	433.18
4279.45	433.12	4285.7	433.14	4296.57	433.13	4302.37	433.15	4314.23	433.16
4323.74	433.02	4348.72	433.08	4362.1	433.07	4367.2	433.04	4387.29	433.05
4401.98	433	4419.63	432.73	4425.52	432.66	4440.73	432.57	4451.02	432.48
4454.94	432.48	4463.61	432.4	4472.07	432.16	4476.21	431.99	4487.09	431.7
4488.99	431.61	4501.72	430.51	4507.38	429.85	4514.45	428.93	4525.04	429.42
4527.19	429.43	4532.74	430.12	4539.95	430.88	4552.51	432.9	4559.81	433.66
4565.13	434.42	4577.47	435.03	4590.71	435.43	4603.49	435.85	4612.78	436.06
4616.28	436.12	4630.44	436.28	4641.53	436.39	4647.56	436.5	4654.13	436.67
4666.86	437.19	4679.63	438.12	4682.87	438.51	4692.41	439.8	4700.53	441.99
4705.2	443.3	4718.19	446.37	4730.44	449.57	4735.31	450.92	4743.06	453.26
4752.96	456.67	4763.12	460.37	4768.55	462.37	4770.62	462.94	4781.34	465.4
4788.27	465.61	4794.12	465.66	4805.93	464.69	4811.01	464.19	4814.68	463.42
4826.65	463.33								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0	.1	1581	.013	1690.08	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1581	1690.08	700	502	530	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1270	436.7	2173	4826.65	435

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1098

INPUT
Description:
Station Elevation Data num= 446

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.02	13.11	433.96	29.61	430.92	46.11	428.9	62.69	428.9
79.12	429.17	95.12	429.51	128.13	429.27	146.54	429.46	177.14	429.87
179.77	429.88	193.65	430.01	196.64	430.11	210.15	430.39	213.52	430.39
226.66	430.48	243.16	430.7	247.13	430.73	259.16	430.9	263.62	431.11
275.67	431.57	280.49	431.99	292.17	432.68	297.36	432.78	308.68	433.2
314.23	433.23	325.18	433.19	330.92	433.12	347.47	433.16	357.69	433.11
374.19	433.18	381.21	433.25	390.69	433.23	398.08	433.24	407.2	433.39
423.2	433.31	431.31	433.35	439.71	433.45	456.21	433.7	472.71	433.77
481.93	433.97	489.22	434.09	498.5	434.29	505.22	434.35	515.16	434.3
521.73	434.33	532.03	434.2	548.91	434.13	554.73	434.13	565.78	434.28
571.24	434.32	582.3	434.36	587.24	434.4	599.01	434.37	603.75	434.34
615.88	434.22	632.75	434.07	653.26	434.04	669.26	433.94	685.76	433.72
716.6	433.58	733.47	433.55	751.28	433.49	766.7	433.59	784.29	433.63
800.45	433.42	817.3	433.32	833.68	433.32	867.42	432.87	882.81	432.8
884.3	432.9	901.11	433.83	915.32	434.78	917.53	434.82	931.82	435.18
951.27	435.27	964.83	435.31	968.14	435.35	981.34	435.39	997.34	435.7
1001.37	435.76	1013.84	435.88	1018.25	435.87	1030.35	435.94	1046.85	436.18
1063.35	436.39	1079.36	436.43	1085.22	436.36	1102.09	436.36	1118.96	436.47
1128.87	436.55	1135.84	436.68	1145.37	436.81	1152.48	436.95	1185.94	437.52
1210.89	437.71	1219.68	437.56	1227.39	437.49	1236.27	437.19	1243.4	437.03
1252.92	436.97	1259.9	436.86	1269.79	436.76	1276.41	436.63	1286.66	436.34
1292.91	436.19	1303.53	435.99	1309.41	435.93	1320.06	435.77	1336.76	435.57
1341.92	435.49	1353.64	435.45	1370.51	435.45	1374.93	435.48	1387.38	435.19
1391.43	435.08	1403.85	434.94	1407.44	434.92	1420.61	434.1	1423.94	433.95
1440.44	432.74	1454.36	432.85	1456.95	432.83	1471.23	431.98	1487.65	431.78
1489.46	431.72	1504.46	430.99	1505.96	430.95	1516	430.07	1545	427.65
1551	425.31	1555.09	424.39	1557.87	423.46	1563	421.75	1613	421.75
1637.12	429.79	1637.47	429.77	1653.54	430.68	1667.47	430.55	1670.27	430.55
1681.8	430.31	1686.99	430.16	1696.14	430.35	1703.72	430.34	1710.47	430.19
1724.69	430.19	1736.67	430.22	1738.71	430.3	1753.04	430.26	1767.38	430.71
1770.13	430.73	1781.72	430.6	1786.86	430.68	1796.05	430.7	1803.58	430.76
1810.21	431.1	1819.92	431.34	1823.68	431.34	1837.05	431.05	1850.44	431.19
1863.79	431.2	1877.15	431.3	1888.43	431.28	1905.03	431.1	1922.16	431.15
1930.27	431.26	1943.67	431.36	1959.41	431.53	1970.43	431.68	1983.54	431.64
1990.15	431.66	1996.73	431.58	2007.27	431.77	2020.04	431.83	2023.45	431.82
2036.85	431.68	2041.53	431.65	2050.25	431.38	2058.65	431.45	2063.53	431.56
2076.64	431.51	2090.04	431.62	2103.44	431.34	2116.84	431.4	2130.24	431.39
2143.77	431.57	2156.68	431.67	2160.38	431.59	2177.5	431.61	2183.29	431.56
2196.65	431.55	2211.75	431.67	2223.42	431.59	2228.88	431.62	2236.63	431.59
2249.82	431.71	2262.62	431.7	2276.58	431.55	2279.74	431.54	2289.93	431.58
2296.87	431.57	2303.29	431.6	2316.58	431.53	2330.6	431.84	2347.73	431.84
2356.4	431.59	2364.86	431.37	2369.8	431.34	2381.98	431.32	2383.2	431.35
2396.6	431.36	2399.11	431.39	2409.74	431.84	2415.72	432.12	2422.99	432.28
2432.84	432.47	2436.39	432.41	2449.97	431.99	2463.14	431.89	2474.17	431.64
2484.22	431.12	2500.83	431.68	2502.8	431.73	2509.76	431.68	2516.17	431.68
2517.96	431.73	2537.04	432.64	2552.21	432.47	2556.37	432.37	2569.34	432.51
2582.8	432.45	2596.08	432.19	2603.07	432.36	2609.43	432.37	2620.2	432.52
2626.41	432.48	2631.96	432.48	2671.75	432.06	2688.18	432.17	2716.14	432.17
2722.44	432.15	2742.86	432.04	2773.3	432.05	2782.64	431.96	2796	432.15
2807.55	432.03	2809.35	432.05	2824.68	432.04	2835.85	432.14	2841.28	432.14
2849.12	432.24	2858.41	432.48	2875.54	432.56	2889.28	432.34	2892.66	432.36
2902.63	432.35	2909.79	432.37	2915.84	432.46	2926.4	432.49	2928.94	432.45
2943.53	432.46	2955.7	432.53	2960.65	432.62	2978.58	433.01	2981.26	433.05
2993.57	433.01	2997	433.15	3005.7	433.19	3014.86	432.84	3023.77	433.04
3030.09	433.23	3033.28	433.16	3051.71	433.2	3070.13	433.09	3088.55	433.21
3103.46	433.2	3106.41	433.18	3115.64	433.01	3124.84	433.06	3133.95	433.03
3143.26	432.96	3152.48	432.97	3164.79	432.88	3177.1	433	3180.1	432.96
3189.22	432.91	3197.97	432.92	3201.34	432.9	3213.63	432.99	3216.39	432.96
3234.81	432.94	3253.23	433.08	3262.71	433.01	3281.78	433.02	3289.52	432.97
3299.17	432.98	3307.94	433.17	3311.42	433.18	3323.7	433.07	3336.01	433.2
3344.79	432.89	3348.31	432.93	3355.42	432.95	3360.62	433.14	3381.07	433.13
3406.76	434.32	3421.65	434.77	3429.06	434.64	3433.92	434.47	3436.34	434.51
3446.23	434.52	3466.16	434.5	3472.62	434.51	3479.1	434.48	3509.47	433.5
3512.84	433.6	3521.53	433.62	3552.34	434.24	3568.08	433.64	3583.51	432.62
3593.48	431.83	3600.27	431.27	3621.92	433.32	3667.67	433.86	3674.15	433.97
3727.67	433.34	3763.5	434.26	3765.7	434.03	3767.18	433.99	3770.21	433.6
3784.13	432.78	3788.71	432.46	3797.81	432.39	3802.55	432.6	3813.29	433.16
3820.97	433.16	3825.5	433.33	3837.55	433.72	3849.77	433.84	3862.02	433.67
3874.28	434	3886.59	434.77	3894.1	435.12	3898.9	435.01	3908.55	435.16
3911.21	435.13	3923.29	434.73	3926.13	434.58	3937.67	434.28	3996.78	434.12

3999.7	434.04	4004.08	434.58	4009.02	434.51	4021.94	434.23	4033.3	434.24
4040.36	433.67	4043.46	433.33	4058.79	431.1	4063.66	430.86	4108.11	444.04
4117.99	444.52	4141.37	443.33	4149.18	442.86	4160.46	441.07	4205.05	440.12
4211.61	440.48	4223.47	441.84	4234.22	444.43	4265.24	442.08	4314.69	434.98
4323.89	434.74	4327.06	434.77	4333.44	434.76	4350.95	434.62	4363.87	434.65
4376.06	434.6	4388.05	434.74	4406.58	434.86	4425	434.86	4443.42	434.57
4449.48	434.52	4461.69	434.46	4473.85	434.42	4479.71	434.43	4486.04	434.4
4510.6	434.15	4516.55	434.12	4522.84	434.14	4535.32	434.12	4553.39	434.27
4571.26	434.29	4583.9	434.23	4596.14	434.25	4620.7	434.22	4633.01	434.12
4662.81	433.72	4681.23	433.38	4699.65	432.88	4719.7	432.22	4730.93	431.82
4736.5	431.71	4743.1	431.4	4755.17	430.97	4767.43	430.31	4779.67	430.09
4791.21	428.76	4804.22	427.73	4809.63	427.72	4816.53	428.05	4828.05	429
4828.83	429.04	4845.92	431.31	4853.09	432.2	4864.34	433.52	4865.4	433.7
4867.54	433.86	4877.66	434.77	4882.76	435.17	4901.18	436.18	4919.6	437.8
4926.62	437.97	4937.47	438.14	4950.96	438.58	4955.89	438.68	4963.21	439.45
4974.31	442.05	4977.72	442.56	4987.75	444.13	4992.74	444.87	5000.06	446.21
5011.16	448.64	5012.35	449.01	5014.82	450.05	5024.4	453.93	5029.02	456.2
5036.62	458.98	5047.44	462.02	5048.93	462.46	5051.92	463.17	5061.19	465.58
5073.44	465.15	5084.29	463.43	5088.85	462.62	5090.54	462.65	5091.15	462.52
5099.68	462.51								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1545	.013	1637.12	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1545	1637.12	510	360	381	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1186	437.5	2020	5099.68	432

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 738

INPUT
Description:
Station Elevation Data num= 448

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	434.97	8.43	433.71	24.06	429.99	25.28	429.72	29.91	429.31
42.12	428.3	45.28	428.45	58.97	428.95	66.47	429.3	75.81	429.79
87.22	429.51	108.99	429.11	125.83	429.53	142.68	430.06	159.52	430.34
171.58	430.86	175.86	430.99	192.7	431.16	213.89	431.3	226.39	431.23
235.09	431.32	243.23	431.35	255.79	431.49	274.74	431.45	276.84	431.43
293.26	431.59	298.04	431.67	310.1	431.65	319.24	431.78	339.92	431.83
343.28	431.88	356.77	431.95	361.01	431.95	376.97	432.54	382.29	432.51
393.81	432.95	403.57	433.02	410.66	432.44	424.31	432.97	426.99	432.95
437.55	432.99	445.46	432.92	460.68	432.56	466.66	432.46	487.85	432.04
494.37	432	510.7	432.01	519.57	432.15	526.17	432.29	540.11	432.48
544.39	432.48	561.23	432.34	567.98	432.22	581.82	432.13	611.26	431.71
628.1	431.5	635.27	431.43	656.47	431.3	661.79	431.29	678.12	431.15
682.38	431.14	711.81	431.22	719.42	431.22	740.62	431.37	745.5	431.42
760.66	431.67	767.94	431.89	778.46	432.25	795.15	433.12	811.85	433.52
820.07	433.57	828.55	433.67	839.49	433.53	844.74	433.42	859.12	433.64
861.44	433.65	873.8	434.1	878.93	434.26	894.83	434.68	911.53	434.79
927.72	434.99	937.64	435.05	944.42	435.14	957.41	435.14	977.82	435.44
994.52	435.33	1010.71	435.5	1016.22	435.54	1027.41	435.73	1044.1	435.89
1055.87	435.95	1077.5	436.01	1094.89	436.23	1127.09	436.57	1134.43	436.72
1143.78	436.86	1160.48	437.2	1176.67	437.36	1193.14	437.27	1210.07	437.29
1212.91	437.26	1226.77	437.22	1232.68	437.11	1243.47	436.85	1252.12	436.57
1259.66	436.36	1271.61	436.22	1276.36	436.1	1293.05	435.81	1309.75	435.76
1326.45	435.35	1342.64	435.26	1359.34	435.14	1376.04	435.06	1392.74	434.95
1409.43	434.73	1428.87	433.33	1442.3	431.88	1447.7	430.89	1458.83	429.19
1517.84	426.42	1540.72	425.34	1554	421.03	1584	421.03	1604	421.03
1642.79	427.29	1656.29	429.6	1659.55	429.83	1672.33	431.04	1676.89	431.05
1688.87	431.14	1705.41	430.51	1714.76	430.94	1729.98	431.3	1744.14	431.39
1754.87	431.37	1771.65	431.14	1786.3	431.08	1788.43	431.04	1800.47	431.02
1805.2	431.07	1814.64	431.09	1821.98	430.98	1828.63	430.84	1838.25	430.89
1842.55	430.84	1855.03	430.89	1885.01	430.94	1888.58	430.91	1899.15	430.98
1905.36	431.33	1913.08	431.6	1921.63	431.55	1938.4	431.9	1955.74	431.92
1969.44	432.05	1983.61	432.07	1988.73	432.11	2005	432.11	2011.52	432.16
2025.69	432.2	2038.55	432.28	2054.03	432.27	2072.11	432.35	2082.1	432.34
2105.15	432.18	2155.48	431.86	2166.6	431.91	2171.75	431.88	2180.6	431.93
2188.53	432.02	2208.87	431.96	2237.17	431.97	2238.86	431.96	2255.13	432.12
2265.08	432.24	2271.91	432.36	2279.25	432.37	2288.68	432.23	2293.42	432.3
2305.46	432.04	2319.15	435.05	2322.24	435.76	2335.54	433.57	2338.51	433.23
2349.6	432.51	2355.28	431.84	2363.73	431.69	2372.06	431.35	2377.87	431.27
2388.84	431.33	2406.13	431.21	2432.38	430.9	2438.66	430.71	2448.21	430.55
2455.44	430.33	2472.21	430.24	2476.55	430.36	2488.99	431.07	2490.68	431.06
2500.16	431.24	2505.26	431.3	2518.64	431.17	2522.03	431.25	2532.81	431.19
2538.81	431.19	2546.98	431.62	2555.59	432.69	2561.15	432.75	2572.37	433.24
2575.24	433.28	2588.63	432.09	2589.37	432.09	2611.84	431.11	2622.19	431.12
2627.19	431.03	2643.23	431.17	2672.01	431.98	2681.17	431.8	2701.77	431.3
2715.94	431.17	2722.34	431.18	2730.11	431.53	2739.12	431.66	2744.15	431.67
2755.39	432.09	2772.37	432.15	2786.33	431.93	2800.47	432.08	2805.72	432.04
2814.6	432.04	2822.49	431.93	2828.58	431.8	2854.01	431.85	2856.58	431.9

2862.19	431.74	2872.32	431.58	2884.91	431.85	2889.09	431.86	2905.87	431.77
2913.06	431.98	2922.14	432.1	2926.99	432.1	2941.16	432.23	2972.47	432.37
2989.25	432.6	3005.51	432.88	3022.29	433.06	3025.75	433.12	3039.07	433.2
3054.07	433.13	3072.62	433.16	3082.09	433.78	3088.89	433.84	3096.05	433.85
3105.67	433.82	3122.44	433.88	3134.4	433.5	3139.22	433.41	3152.19	433.84
3164.06	433.69	3176.18	433.7	3187.8	433.67	3194.94	433.59	3214.22	433.53
3223.73	433.55	3235.74	433.69	3252.8	433.55	3259.64	433.56	3295.31	433.24
3302.68	433.07	3310.07	432.96	3319.3	432.9	3331.32	432.88	3359.9	433.28
3372.48	435.42	3388.52	434.11	3397.79	433.5	3405.92	433.6	3414.87	433.6
3425.21	433.76	3426.89	434.11	3429.66	434.24	3438.85	435.24	3444.5	434.91
3450.68	435.28	3453.56	435.01	3462.66	436.45	3518.84	441.14	3521.06	441.05
3524.29	441.31	3540.35	441.31	3556.15	440.27	3569.97	440	3578.34	438.96
3581.99	438.58	3593.97	437.19	3597.63	437.48	3605.91	437.71	3616.91	434.56
3619.4	434.38	3636.2	433.48	3641.77	432.63	3654.9	431.34	3674.19	429.5
3682.65	430.61	3689.39	432.37	3693.48	432.27	3710.08	432.31	3716.71	432.42
3754.75	433.3	3770.04	433.79	3777.76	433.97	3789.33	434.1	3796.98	434.04
3808.61	434.28	3809.63	434.26	3827.9	433.17	3832.8	433.06	3846.6	433.57
3856.51	433.64	3865.89	433.79	3872.87	433.87	3885.18	433.96	3892.55	433.97
3904.46	433.91	3916.51	434.62	3923.75	434.77	3928.37	435.08	3936.12	435.01
3942.45	435.17	3952.08	436.58	3961.74	436.12	3967.99	435.69	3976.06	435.54
3981.03	436.03	3988.01	436.58	3999.37	434.71	4000.31	434.65	4016.19	434.94
4023.1	434.61	4050.23	434.58	4071.21	435.07	4076.88	434.99	4094.48	434.86
4096.16	434.88	4107.54	434.82	4115.45	434.89	4133.92	434.85	4169.91	434.84
4190.86	434.73	4211.3	434.73	4239.23	434.37	4245.79	434.77	4268.72	434.78
4277.31	434.85	4301.26	436.37	4355.41	436.19	4364.43	435.78	4379.82	435.55
4382.25	435.48	4393.01	433.84	4438.54	432.18	4457.01	431.12	4479.56	430.4
4489.65	430.4	4498.85	430.96	4501.61	431.16	4506.32	431.35	4517.55	431.92
4525.33	432.14	4536.84	432.32	4544.49	432.86	4556.13	433.91	4563.77	434.07
4575.42	433.95	4632.59	435.54	4644.75	435.37	4651.98	435.32	4668.78	435.31
4680.8	435.19	4692.77	435.12	4704.51	434.96	4728.54	434.79	4747.83	434.5
4764.33	434.19	4776.28	434.07	4786.41	434.11	4799.96	433.83	4805.11	433.63
4811.87	433.16	4824.4	432.49	4835.9	431.96	4843.68	431.55	4847.91	431.16
4854.91	430.72	4859.9	430.33	4862.97	430.23	4871.85	429.17	4882.26	426.43
4883.76	426.12	4886.29	425.9	4895.53	425.39	4900.96	424.97	4907.44	425.42
4918.15	427.21	4920.25	427.59	4931.39	428.87	4939.53	429.06	4948.91	430.4
4953.08	430.93	4981.4	432.83	5001.46	432.95	5013.27	433.07	5026.27	433.16
5044.65	434.24	5051	434.38	5073.96	435.77	5076.52	435.88	5092.66	435.97
5098.46	435.95	5107.9	436.01	5122.43	435.99	5134.45	435.91	5146.46	435.96
5158.48	435.93	5169.81	435.83	5182.21	435.53	5194.03	435.29	5207.8	435.26
5218.01	435.18	5227.08	435.14	5234.88	436.92	5256.6	442.18	5266.26	445.64
5280.4	449.23	5298.12	456.07	5304.31	457.87	5322.93	465.09	5325.59	465.39
5329.99	465.51	5337.56	465.54	5342.22	465.18	5349.51	465.14	5361.51	464.82
5373.24	463.05	5374.19	462.79	5388.84	462.77				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1458.83	.04	1672.33	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1458.83	1672.33	0	0	0	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	1160	438	F
1730	5500	438	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
2323	5388.84	435.8

SUMMARY OF MANNING'S N VALUES

River:Thompsons

Reach	River Sta.	n1	n2	n3
Thompsons	4901	.1	.013	.1
Thompsons	4602	.1	.013	.1
Thompsons	4104	.1	.013	.1
Thompsons	3597	.1	.013	.1
Thompsons	3098	.1	.013	.1
Thompsons	2597	.1	.013	.1
Thompsons	2097	.1	.013	.1
Thompsons	1600	.1	.013	.1
Thompsons	1098	.1	.013	.06
Thompsons	738	.1	.04	.06

SUMMARY OF REACH LENGTHS

River: Thompsons

Reach	River Sta.	Left	Channel	Right
Thompsons	4901	300	299	290
Thompsons	4602	517	498	440

Thompsons	4104	650	507	490
Thompsons	3597	510	499	584
Thompsons	3098	690	501	980
Thompsons	2597	760	500	410
Thompsons	2097	460	497	900
Thompsons	1600	700	502	530
Thompsons	1098	510	360	381
Thompsons	738	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Thompsons

Reach	River Sta.	Contr.	Expan.
Thompsons	4901	.1	.3
Thompsons	4602	.1	.3
Thompsons	4104	.1	.3
Thompsons	3597	.1	.3
Thompsons	3098	.1	.3
Thompsons	2597	.1	.3
Thompsons	2097	.1	.3
Thompsons	1600	.1	.3
Thompsons	1098	.1	.3
Thompsons	738	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Thompsons	4901	100 year	2740.00	430.75	434.89	434.89	436.64	0.001688	10.60	258.43	74.84	1.01
Thompsons	4901	25 year	2170.00	430.75	434.34	434.34	435.88	0.001751	9.95	218.12	71.53	1.00
Thompsons	4901	10 year	1820.00	430.75	433.97	433.97	435.36	0.001804	9.48	191.99	69.31	1.00
Thompsons	4901	5 year	1510.00	430.75	433.61	433.61	434.87	0.001865	9.00	167.75	67.18	1.00
Thompsons	4901	2 year	1050.00	430.75	433.03	433.03	434.05	0.001991	8.12	129.32	63.65	1.00
Thompsons	4602	100 year	2680.00	430.00	434.09	434.09	435.81	0.001688	10.53	254.84	79.62	1.00
Thompsons	4602	25 year	2190.00	430.00	433.61	433.61	435.15	0.001756	9.99	219.24	71.62	1.01
Thompsons	4602	10 year	1850.00	430.00	433.25	433.25	434.66	0.001807	9.54	193.97	69.47	1.01
Thompsons	4602	5 year	1530.00	430.00	432.88	432.88	434.15	0.001868	9.05	169.12	67.29	1.01
Thompsons	4602	2 year	1060.00	430.00	432.29	432.29	433.32	0.001995	8.15	130.05	63.71	1.01
Thompsons	4104	100 year	2680.00	428.75	432.85	432.69	434.37	0.001456	9.89	279.56	103.31	0.94
Thompsons	4104	25 year	2190.00	428.75	432.24	432.24	433.73	0.001773	9.77	224.64	80.71	1.01
Thompsons	4104	10 year	1850.00	428.75	431.92	431.92	433.26	0.001827	9.28	199.33	75.23	1.00
Thompsons	4104	5 year	1530.00	428.75	431.57	431.57	432.78	0.001891	8.82	173.51	72.62	1.01
Thompsons	4104	2 year	1060.00	428.75	431.00	431.00	431.98	0.002021	7.96	133.10	68.33	1.01
Thompsons	3597	100 year	2870.00	427.50	431.77	431.77	433.55	0.001655	10.69	268.50	75.64	1.00
Thompsons	3597	25 year	2290.00	427.50	431.22	431.22	432.79	0.001715	10.06	227.71	72.34	1.00
Thompsons	3597	10 year	1910.00	427.50	430.83	430.83	432.25	0.001766	9.57	199.67	69.97	1.00
Thompsons	3597	5 year	1580.00	427.50	430.45	430.45	431.74	0.001850	9.12	173.31	67.67	1.00
Thompsons	3597	2 year	1100.00	427.50	429.84	429.84	430.90	0.001974	8.23	133.70	64.07	1.00
Thompsons	3098	100 year	2870.00	426.24	430.51	430.51	432.30	0.001675	10.73	267.38	75.56	1.01
Thompsons	3098	25 year	2290.00	426.24	429.96	429.96	431.55	0.001739	10.10	226.66	72.26	1.01
Thompsons	3098	10 year	1910.00	426.24	429.57	429.57	431.00	0.001793	9.61	198.68	69.90	1.00

Thompsons	3098	5 year	1580.00	426.24	429.20	429.20	430.49	0.001846	9.11	173.42	67.69	1.00
Thompsons	3098	2 year	1100.00	426.24	428.59	428.59	429.65	0.001981	8.24	133.54	64.06	1.01
Thompsons	2597	100 year	3060.00	425.00	429.43	429.43	431.28	0.001657	10.92	280.34	76.57	1.01
Thompsons	2597	25 year	2400.00	425.00	428.82	428.82	430.44	0.001726	10.23	234.51	72.89	1.01
Thompsons	2597	10 year	1980.00	425.00	428.39	428.39	429.85	0.001785	9.71	203.82	70.32	1.01
Thompsons	2597	5 year	1630.00	425.00	428.00	428.00	429.32	0.001846	9.21	177.05	68.00	1.01
Thompsons	2597	2 year	1110.00	425.00	427.35	427.35	428.41	0.001982	8.26	134.31	64.12	1.01
Thompsons	2097	100 year	3060.00	423.75	428.48	428.18	430.06	0.001316	10.09	303.27	78.35	0.90
Thompsons	2097	25 year	2400.00	423.75	427.57	427.57	429.19	0.001726	10.23	234.55	72.90	1.01
Thompsons	2097	10 year	1980.00	423.75	427.14	427.14	428.60	0.001783	9.71	203.90	70.33	1.01
Thompsons	2097	5 year	1630.00	423.75	426.76	426.75	428.07	0.001824	9.17	177.76	68.07	1.00
Thompsons	2097	2 year	1110.00	423.75	426.12	426.11	427.16	0.001943	8.21	135.18	64.20	1.00
Thompsons	1600	100 year	3300.00	422.75	427.38	427.38	429.30	0.001638	11.11	296.90	78.26	1.01
Thompsons	1600	25 year	2510.00	422.75	426.68	426.68	428.33	0.001692	10.29	243.84	74.01	1.00
Thompsons	1600	10 year	2060.00	422.75	426.24	426.24	427.71	0.001743	9.75	211.32	71.27	1.00
Thompsons	1600	5 year	1690.00	422.75	425.83	425.83	427.15	0.001807	9.24	182.93	68.80	1.00
Thompsons	1600	2 year	1120.00	422.75	425.12	425.12	426.18	0.001979	8.27	135.36	64.44	1.01
Thompsons	1098	100 year	3300.00	421.75	426.92		428.38	0.001095	9.68	340.95	81.65	0.83
Thompsons	1098	25 year	2510.00	421.75	426.02	425.68	427.37	0.001267	9.30	269.78	76.64	0.87
Thompsons	1098	10 year	2060.00	421.75	425.55	425.23	426.75	0.001299	8.79	234.42	74.03	0.87
Thompsons	1098	5 year	1690.00	421.75	425.07	424.83	426.19	0.001406	8.46	199.72	70.93	0.89
Thompsons	1098	2 year	1120.00	421.75	424.33	424.12	425.21	0.001473	7.52	148.88	65.46	0.88
Thompsons	738	100 year	3420.00	421.03	427.07	424.45	427.49	0.002501	5.21	656.79	138.12	0.42
Thompsons	738	25 year	2620.00	421.03	426.07	423.91	426.45	0.002498	4.94	529.83	120.24	0.42
Thompsons	738	10 year	2150.00	421.03	425.52	423.57	425.86	0.002501	4.62	465.00	116.96	0.41
Thompsons	738	5 year	1730.00	421.03	424.99	423.24	425.28	0.002502	4.29	403.38	113.76	0.40
Thompsons	738	2 year	1130.00	421.03	424.12	422.70	424.33	0.002504	3.69	306.27	108.51	0.39

HEC-RAS Report for Alternative 3

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                  HEC-RAS Version 3.1.1 May 2003
                  U.S. Army Corp of Engineers
                  Hydrologic Engineering Center
                   609 Second Street, Suite D
                   Davis, California 95616-4687
                        (916) 756-1104

     X     X  XXXXXX    XXXX        XXXX      XX      XXXX
     X     X  X        X    X       X   X    X  X    X
     X     X  X        X            X   X   X    X   X
     XXXXXXX  XXXX     X       XXX  XXXX    XXXXXX    XXXX
     X     X  X        X            X  X    X    X        X
     X     X  X        X    X       X   X   X    X        X
     X     X  XXXXXX    XXXX        X    X  X    X   XXXXX
```

PROJECT DATA
Project Title: Prelim. Analysis Thompson's Branch
Project File : TBrPrelim.prj
Run Date and Time: 5/8/2007 11:03:20 AM

Project in English units

PLAN DATA

Plan Title: Geometry w/90 BW_FILLXS
Plan File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.p07

Geometry Title: EXTENDED Geometry w/90 foot bw Channel
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g09

Flow Title : Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Plan Summary Information:

Number of:				
Cross Sections =	10		Mulitple Openings =	0
Culverts =	0		Inline Structures =	0
Bridges =	0		Lateral Structures =	0

Computational Information
- Water surface calculation tolerance = 0.01
- Critical depth calculaton tolerance = 0.01
- Maximum number of interations = 20
- Maximum difference tolerance = 0.3
- Flow tolerance factor = 0.001

Computation Options
- Critical depth computed only where necessary
- Conveyance Calculation Method: At breaks in n values only
- Friction Slope Method: Average Conveyance
- Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Flow Data (cfs)

River	Reach	RS	100 year	25 year	10 year	5 year	2 year
Thompsons	Thompsons	4901	2740	2170	1820	1510	1050
Thompsons	Thompsons	4602	2680	2190	1850	1530	1060
Thompsons	Thompsons	3597	2870	2290	1910	1580	1100
Thompsons	Thompsons	2597	3060	2400	1980	1630	1110
Thompsons	Thompsons	1600	3300	2510	2060	1690	1120
Thompsons	Thompsons	738	3420	2620	2150	1730	1130

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Thompsons	Thompsons	100 year		Normal S = 0.0025
Thompsons	Thompsons	25 year		Normal S = 0.0025
Thompsons	Thompsons	10 year		Normal S = 0.0025
Thompsons	Thompsons	5 year		Normal S = 0.0025
Thompsons	Thompsons	2 year		Normal S = 0.0025

GEOMETRY DATA

Geometry Title: EXTENDED Geometry w/90 foot bw Channel
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g09

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4901

INPUT
Description:
Station Elevation Data num= 96

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	444.78	3.03	444.68	9.59	444.46	19.83	444.26	26.09	444.15
36.62	443.85	42.59	443.67	53.08	443.35	58.6	443.11	69.7	442.75
75.1	442.6	86.49	442.32	91.6	442.19	103.28	442.02	108.1	441.95
120.08	441.91	124.61	441.89	136.49	441.83	140.61	441.83	153.15	441.66
157.11	441.63	169.95	441.44	173.61	441.36	186.74	441.06	190.12	440.95
203.53	440.64	206.62	440.56	219.9	440.46	222.62	440.35	236.61	439.89
239.12	439.85	253.4	439.82	255.63	439.82	270.2	439.82	272.13	439.78
286.99	439.65	288.63	439.59	303.32	439.27	304.63	439.28	320.07	439.2
321.14	439.19	336.86	439.08	337.64	439.08	353.65	439.15	354.14	439.15
355.48	439.15	365	441.21	383.5	437.58	404	430.75	417.35	430.75
429.71	430.75	494	430.75	509.79	436.01	517.34	435.99	518.14	435.99
533.85	436.03	534.64	436.04	549.88	436.11	550.64	436.11	566.37	436.19
567.14	436.2	582.89	436.47	583.64	436.47	599.4	436.77	600.14	436.79
615.91	437.14	616.64	437.16	631.94	438.2	632.64	438.23	648.43	438.84
649.14	438.86	664.95	439.36	665.64	439.39	681.46	440.15	682.14	440.18
697.97	440.73	698.64	440.76	714	441.22	714.64	441.24	730.5	441.78
731.14	441.8	747.01	442.15	747.64	442.18	763.52	442.79	764.14	442.82
780.03	443.48	780.64	443.5	796.06	444.64	796.64	444.66	812.56	446.19
813.14	446.23	829.07	446.25	829.64	446.26	845.58	446.52	846.14	446.54
849.41	446.64								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	383.5	.04	509.79	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
383.5	509.79	300	299	290	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4602

INPUT
Description:
Station Elevation Data num= 87

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	440.68	3.59	440.73	6.09	440.71	19.59	440.54	22.14	440.49
36.09	439.95	38.61	439.9	52.59	439.67	55.08	439.6	80	439.24
95.41	436.2	114	430	130.19	430	148.87	430	204	430
226	435.5	337.37	435.61	340.07	435.67	341.08	435.7	352.64	436.01
358.15	436.12	365.34	436.38	375.76	436.79	378.16	436.87	384.6	437.22
390.96	437.55	393.37	437.7	403.74	438.03	410.98	438.38	416.51	438.72
428.59	439.21	429.27	439.23	431.12	439.32	441.8	439.82	445.67	439.98
454.54	440.38	463.28	440.7	467.37	440.84	478.35	441.1	480.2	441.14
480.89	441.16	493.02	441.54	498.5	441.61	505.85	441.8	516.11	442.07
518.62	442.17	525.58	442.45	531.14	442.67	533.18	442.76	543.87	443.07
550.79	443.4	556.64	443.52	568.4	443.96	569.41	443.99	572.09	444.09
582.23	444.39	586.01	444.46	595.06	444.33	603.62	444.34	607.79	444.36
619.32	444.49	620.33	444.5	620.7	444.5	633.09	444.76	638.31	444.86
645.87	445.17	655.91	445.47	658.64	445.49	665.84	445.6	671.44	445.67
673.52	445.69	684.26	445.77	691.13	445.9	696.96	445.89	708.21	446.01
709.53	446.03	713.07	446.06	722.36	446.11	725.82	446.13	735.18	446.25
743.43	446.36	748.01	446.38	760.3	446.68	760.84	446.69	761.04	446.7
773.61	446.85	776.69	446.87						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	95.41	.04	226	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
95.41	226	517	498	440	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4104

INPUT
Description:
Station Elevation Data num= 265

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.12	6.1	435.47	11.47	434.9	22.73	433.25	27.97	432.44
39.37	431.58	44.47	431.22	55.65	431.57	60.47	431.69	72.13	431.84
76.98	431.93	88.77	431.49	93.48	431.32	105.4	430.85	109.98	430.64
122.04	430.44	126.48	430.41	138.3	430.82	142.48	430.94	154.81	431.24
158.98	431.34	171.44	431.49	175.48	431.61	200.88	431.42	208.48	431.23
220.95	431.04	224.48	431.03	237.48	431.05	240.98	431.05	254.11	431.21
257.48	431.27	270.75	431.72	273.98	431.74	287.38	432.73	290.48	432.82
303.6	431.55	306.48	431.45	320.15	432.1	322.98	432.18	336.78	432.15
339.48	432.18	353.42	431.89	355.98	431.88	370.05	431.79	372.48	431.78
386.25	431.95	388.48	431.95	402.82	432.01	404.99	432.02	419.45	432.09
421.49	432.12	436.09	432.1	437.99	432.07	452.72	432.19	454.49	432.21
468.9	432.22	470.49	432.24	485.49	432.2	486.99	432.19	502.12	431.97
503.49	431.96	518.76	431.97	519.99	431.96	535.39	431.94	536.49	431.94
551.55	431.93	552.49	431.93	568.16	432.07	568.99	432.08	584.79	432.42
585.49	432.43	601.43	432.73	601.99	432.75	618.06	432.93	618.49	432.94
634.2	433.16	634.49	433.17	650.83	433.59	650.99	433.59	667.46	434.16
667.49	434.16	671.36	434.2	683.99	434.31	684.1	434.31	700.49	434.37
700.72	434.37	716.5	434.17	716.86	434.16	733	434.09	733.49	434.09
749.5	434.03	750.12	434.04	766	434.14	766.76	434.13	782.5	433.84
783.36	433.83	798.5	433.75	799.52	433.75	815	433.8	816.15	433.81
831.5	433.96	832.78	433.94	848	433.99	856.81	433.95	946.5	433.14
948.64	433.11	962.5	432.99	964.84	432.99	979	433.02	981.47	433.01
995.5	433	998.1	433.03	1005.03	433.11	1052.01	433.71	1057.95	433.79
1061.01	433.86	1064.13	433.84	1077.51	433.8	1080.76	433.77	1094.01	433.77
1107.04	436.09	1113.92	436.88	1126.51	437.36	1130.16	437.55	1143.01	438.42
1146.79	438.58	1159.51	439.34	1163.42	439.31	1176.01	439.06	1180.06	439.09
1192.51	439.05	1196.56	439.19	1208.51	439.67	1212.82	439.85	1225.01	440.01
1229.45	440.13	1241.51	440.09	1253.38	439.93	1258.01	439.68	1272.1	439.69
1279.2	439.64	1290.51	439.66	1295.48	439.51	1307.01	439.11	1313	438.94
1334.2	435.02	1353	428.75	1443	428.75	1466	434.5	1582.71	434.57
1583.66	434.57	1585.15	434.59	1595.62	434.7	1602.21	434.76	1607.58	434.8
1616.12	434.89	1619.53	434.92	1621.71	434.95	1631.42	435.06	1641.2	435.13
1643.31	435.14	1646.62	435.17	1655.26	435.25	1660.7	435.31	1667.1	435.39
1677.58	435.52	1678.84	435.53	1679.61	435.54	1690.79	435.62	1699.11	435.69
1702.76	435.72	1708.55	435.79	1714.68	435.88	1718.61	435.91	1726.58	435.99
1738.1	436.07	1738.47	436.07	1739.05	436.07	1750.43	436.18	1757.6	436.23
1762.31	436.25	1770.02	436.29	1774.02	436.31	1776.51	436.33	1785.87	436.34
1796.01	436.28	1797.77	436.3	1800.52	436.31	1809.71	436.39	1815.51	436.42
1821.68	436.52	1831.48	436.73	1833.64	436.78	1835	436.8	1845.61	436.96
1854.5	437.08	1857.52	437.13	1862.45	437.2	1869.22	437.28	1873.41	437.37
1881.03	437.5	1892.91	437.6	1892.92	437.6	1892.95	437.6	1904.89	437.81
1912.41	437.9	1916.85	437.95	1923.92	438.04	1928.79	438.1	1931.9	438.17
1940.68	438.35	1951.4	438.4	1952.56	438.42	1954.42	438.44	1964.28	438.57
1970.31	438.61	1976.13	438.66	1985.38	438.75	1988.1	438.78	1989.81	438.81
2000.06	438.94	2009.31	439.06	2012.03	439.09	2016.35	439.11	2023.95	439.16
2028.8	439.21	2035.84	439.34	2046.85	439.53	2047.74	439.54	2048.3	439.55
2059.49	439.81	2067.21	439.95	2071.31	439.98	2077.82	440.09	2083.24	440.19
2086.71	440.25	2095.13	440.39	2106.21	440.59	2107.03	440.61	2108.32	440.67
2118.99	441.06	2125.7	441.4	2130.95	441.5	2139.28	441.65	2142.92	441.72
2145.2	441.76	2154.7	441.89	2164.11	442.07	2166.48	442.13	2170.25	442.26
2178.4	442.54	2183.61	442.79	2190.29	443.04	2200.75	443.27	2202.19	443.31
2203.1	443.38	2214.16	444.45	2222.6	445.58	2226.12	445.89	2231.72	446.62
2238.05	447.2	2242.1	447.27	2249.8	447.34	2261.01	447.46	2261.42	447.47

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1313	.06	1334.2	.04	1466	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1313	1466	650	507	490	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1229.45	440.13	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3597

INPUT
Description:
Station Elevation Data num= 345

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.05	6.13	435.53	12.12	435.04	22.3	432.82	28.63	431.64
38.46	430.65	45.13	429.97	54.63	430.56	61.63	430.86	70.52	431.18
77.64	431.32	86.46	431.25	94.14	431.17	102.63	431.06	110.64	430.97
118.79	431.07	127.15	431.14	134.96	431.24	143.65	431.34	150.9	431.36
159.66	431.37	166.8	431.34	176.16	431.43	182.96	431.43	192.66	431.47
199.13	431.76	209.17	432.03	215.29	432.18	225.67	432.49	231.28	432.62
241.67	432.65	247.13	432.52	258.18	432.53	263.29	432.5	274.68	432.27
279.46	432.21	291.18	432.11	295.62	432.11	307.69	432.07	311.67	432.01
323.69	431.79	327.46	431.74	340.19	431.55	343.63	431.52	356.7	431.34

359.79	431.34	373.2	431.28	375.96	431.27	389.7	431.4	392.05	431.39
405.71	431.35	407.79	431.34	422.21	431.27	423.96	431.24	438.71	431.08
440.12	431.08	455.22	430.89	456.29	430.89	471.72	430.67	472.43	430.67
487.73	430.67	488.13	430.67	504.23	430.52	504.29	430.52	507.26	430.52
520.46	430.51	520.73	430.51	536.63	430.5	537.24	430.5	552.8	430.54
553.74	430.53	568.52	430.43	569.74	430.43	584.65	430.51	586.25	430.52
600.82	430.48	602.75	430.48	616.99	430.53	619.25	430.53	633.16	430.51
635.76	430.51	648.92	430.58	651.76	430.57	665	430.65	668.26	430.66
681.17	430.76	684.77	430.8	697.34	430.91	701.27	430.96	713.51	431.1
717.77	431.17	729.33	431.29	733.78	431.35	745.36	431.41	750.28	431.42
761.53	431.45	766.78	431.46	777.7	431.58	783.29	431.6	793.87	431.7
799.79	431.79	809.73	431.92	815.8	431.96	825.72	432.1	832.3	432.23
841.89	432.37	848.8	432.46	858.06	432.58	865.31	432.68	874.23	432.88
881.81	433.07	890.14	433.34	897.81	433.42	906.08	433.45	914.32	433.5
922.25	433.47	930.82	433.52	1389	433.5	1413	427.5	1503	427.5
1522.39	433.96	1535.54	434.54	1537.92	434.63	1551.38	434.57	1553.93	434.56
1567.56	434.18	1570.43	434.09	1583.82	434.09	1586.93	434.1	1600.07	434.36
1603.43	434.44	1616.33	434.54	1619.93	434.57	1632.21	434.35	1635.94	434.33
1648.35	434.39	1651.86	434.41	1652.55	434.42	1661.2	434.64	1672.3	434.73
1673.12	434.72	1674.35	434.72	1684.96	434.67	1692.05	434.66	1696.8	434.57
1703.92	434.42	1708.67	434.31	1711.8	434.25	1720.42	434.25	1730.96	434.29
1732.14	434.31	1733.93	434.32	1743.99	434.39	1750.71	434.53	1755.83	434.63
1763.5	434.73	1767.7	434.8	1770.46	434.85	1779.61	434.84	1790.21	434.78
1791.52	434.77	1793.51	434.76	1803.44	434.71	1809.96	434.67	1815.25	434.76
1823.53	434.87	1826.92	434.92	1829.12	434.93	1838.72	435.02	1848.87	435.12
1850.56	435.1	1853.09	435.07	1862.46	434.95	1868.62	434.9	1874.37	434.83
1883.11	434.71	1886.26	434.67	1888.37	434.65	1898.11	434.61	1908.12	434.55
1909.91	434.55	1912.68	434.57	1921.59	434.61	1927.28	434.65	1933.39	434.72
1942.69	434.81	1945.31	434.83	1947.03	434.85	1957.22	434.88	1966.78	434.9
1969.13	434.91	1972.71	434.9	1981	434.89	1986.53	434.89	1992.84	434.88
2002.27	434.87	2004.69	434.86	2006.28	434.86	2016.41	434.89	2025.44	434.86
2028.16	434.85	2032.29	434.83	2040.02	434.78	2045.19	434.75	2051.86	434.71
2061.85	434.68	2063.71	434.68	2064.94	434.67	2075.63	434.65	2084.69	434.62
2087.54	434.62	2091.87	434.6	2099.45	434.58	2104.44	434.53	2111.24	434.54
2121.89	434.52	2122.92	434.52	2123.59	434.51	2134.75	434.5	2143.35	434.43
2146.59	434.42	2151.45	434.47	2158.48	434.55	2163.1	434.55	2170.39	434.55
2181.47	434.64	2182.3	434.65	2182.85	434.65	2194.14	435.03	2202.6	434.89
2205.91	434.74	2211.03	434.85	2217.58	434.83	2221.75	434.88	2229.41	434.66
2241.05	434.54	2241.32	434.53	2241.5	434.52	2253.24	433.77	2261.26	432.99
2265.15	432.78	2271.07	432.43	2277.03	432.11	2281.01	431.99	2288.87	431.79
2300.63	431.53	2300.71	431.53	2300.76	431.53	2312.4	431.59	2319.91	431.32
2324.17	431.36	2330.65	431.32	2336.05	431.71	2339.66	431.85	2347.89	432.05
2359.42	432.97	2359.73	432.99	2360.21	433.02	2371.64	433.41	2379.17	433.94
2383.56	434.05	2390.23	434.18	2395.47	434.01	2398.92	434.12	2407.23	434.33
2418.07	434.78	2418.93	434.83	2420.25	434.88	2430.78	434.97	2437.82	435.14
2442.62	435.22	2449.81	435.43	2454.49	435.52	2457.57	435.63	2466.41	435.74
2477.33	435.98	2478.32	435.95	2479.83	435.9	2490.17	435.42	2497.08	435.28
2501.92	435.27	2509.39	435.21	2513.57	435.16	2516.23	435.14	2525.43	435.16
2535.98	435.19	2537.34	435.18	2539.41	435.18	2549.26	435.19	2555.73	435.17
2561.17	435.19	2569.43	435.15	2573.06	435.15	2575.49	435.15	2584.9	435.37
2595.24	435.58	2596.71	435.6	2598.99	435.66	2608.39	435.93	2614.39	435.97
2620.19	435.98	2629.01	436.09	2632.09	436.13	2634.14	436.16	2643.93	436.19
2653.89	436.19	2655.77	436.2	2658.57	436.21	2667.66	436.21	2673.65	436.27
2679.57	436.36	2688.59	436.46	2691.49	436.49	2693.4	436.54	2703.21	436.89
2712.55	437.03	2714.95	437.11	2718.6	437.24	2726.81	437.6	2732.3	437.71
2738.66	437.86	2748.17	438.29	2750.51	438.4	2752.05	438.44	2762.42	438.55
2771.8	438.75	2774.34	438.78	2778.18	438.84	2786.2	438.89	2791.56	438.95
2797.92	439.02	2807.75	439.11	2809.56	439.14	2810.71	439.17	2821.45	439.34
2830.46	439.6	2833.36	439.69	2837.77	439.74	2845.27	439.85	2850.21	439.93
2857.19	440.1	2867.78	440.27	2869.09	440.3	2869.96	440.32	2875.28	440.48

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1389	.04	1522.39	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1389	1522.39	510	499	584	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1770	2438	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3098

INPUT
Description:
Station Elevation Data num= 419

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.2	1.24	436.13	14.84	434.22	17.24	433.89	31.14	431.7
33.74	431.33	47.51	429.83	50.24	429.45	63.89	430.18	66.74	430.35
80.26	430.92	83.24	431.05	96.23	431.18	99.24	431.22	112.51	430.73
115.74	430.64	128.88	430.51	132.24	430.46	145.26	430.79	148.74	430.87
165.24	431.1	177.62	431.14	181.24	431.14	193.88	431.19	197.74	431.2
210.25	431.27	226.63	431.39	230.74	431.43	243	431.49	247.24	431.56
259.01	431.53	263.24	431.51	275.25	431.39	279.74	431.31	291.62	431.34

308	431.42	312.74	431.43	324.37	431.36	329.24	431.34	345.25	431.24
372.99	430.99	378.25	430.92	394.75	431.01	405.74	431.14	411.25	431.23
421.79	431.33	427.25	431.35	437.99	431.34	443.75	431.37	454.36	431.51
460.25	431.56	487.11	431.54	493.25	431.52	503.17	431.64	509.25	431.74
525.75	431.76	542.25	431.89	552.11	431.88	558.75	431.91	568.48	431.99
575.25	432.07	584.56	432.12	591.25	432.17	607.75	432.02	617.1	432.05
624.25	432.03	640.75	432.15	657.25	432.14	665.95	432.11	673.26	432.11
682.1	432.09	689.76	432.05	698.47	432.17	706.26	432.31	714.85	432.39
722.76	432.41	739.26	432.4	755.26	432.36	771.76	432.49	779.84	432.5
788.26	432.49	796.22	432.56	804.76	432.57	812.59	432.65	821.26	432.83
837.26	432.7	844.84	432.66	853.76	432.54	861.21	432.48	870.26	432.53
886.76	432.45	893.96	432.45	903.26	432.4	910.12	432.46	919.26	432.52
926.21	432.55	942.58	432.52	952.26	432.54	958.96	432.53	975.33	432.44
985.26	432.43	991.51	432.46	1001.27	432.47	1007.58	432.52	1017.77	432.56
1023.95	432.56	1040.33	432.63	1050.77	432.76	1056.66	432.94	1059.61	433.39
1072.96	434.33	1080.36	434.32	1102.72	435.18	1109.42	435.54	1137.67	435.54
1143.71	435.47	1238.36	434.69	1261.77	434.41	1334.36	433.31	1336.06	433.21
1339.39	433.02	1345.78	433.39	1355	433	1383.82	431.98	1395.9	427.95
1401	426.25	1491	426.25	1513	433.58	1521.06	433.5	1529.67	433.53
1533.52	433.64	1545.97	433.82	1547.79	433.85	1565.9	434.01	1581.38	433.82
1582.83	433.8	1583.47	433.79	1595.28	433.72	1601.59	433.67	1607.75	433.78
1619.7	433.95	1620.21	433.95	1637.82	434.12	1645.03	434.1	1655.93	434.11
1660.71	434.08	1669.6	434.01	1673.5	433.97	1691.62	434.33	1706.91	434.28
1709.73	434.3	1727.85	433.99	1731.84	434.01	1740.64	433.89	1744.29	433.88
1745.96	433.86	1756.47	434.13	1763.53	434.13	1768.72	434.23	1780.01	434.69
1781.14	434.73	1781.65	434.74	1793.6	434.85	1799.76	434.98	1806.07	434.94
1830.95	434.91	1835.99	434.93	1843.2	434.93	1853.56	434.97	1855.38	434.97
1859.34	434.95	1867.83	434.88	1871.68	434.88	1892.76	434.8	1899.31	434.84
1905.22	434.86	1907.91	434.86	1917.69	434.91	1926.02	435.01	1930.07	435.03
1939.27	435.05	1954.64	435.06	1961.71	435.04	1967.04	435.07	1979.82	435.07
1991.92	435.03	1997.94	435.06	2004.38	435.06	2016.05	434.89	2016.83	434.89
2018.6	434.9	2033.62	435.02	2041.29	434.96	2051.74	434.84	2066.15	434.7
2078.61	434.5	2087.97	434.32	2091.08	434.28	2097.94	434.25	2103.54	434.21
2106.08	434.21	2115.8	434.27	2123.65	434.28	2128.1	434.35	2140.55	434.49
2141.77	434.51	2152.96	434.65	2159.88	434.68	2177.27	434.84	2177.77	434.85
2178	434.85	2196.11	435.05	2202.56	435.09	2213.68	435.13	2227.21	435.12
2231.8	434.94	2239.61	434.9	2249.91	435.05	2252.02	435.04	2264.46	435.59
2268.03	435.65	2286.14	435.6	2289.33	435.56	2296.56	435.52	2301.53	435.46
2303.71	435.46	2313.95	435.42	2321.83	435.49	2326.41	435.5	2338.87	435.33
2339.94	435.33	2351.27	435.4	2358.06	435.37	2363.68	435.44	2375.9	435.51
2376.17	435.51	2388.29	435.55	2393.74	435.58	2411.86	435.44	2413.11	435.41
2415.86	435.37	2429.97	435.11	2437.93	435.05	2448.09	435.15	2450.34	435.16
2455.23	435.17	2466.2	435.21	2487.33	435.38	2512.26	435.47	2520	435.44
2524.73	435.43	2535.16	435.35	2537.19	435.34	2538.12	435.34	2549.59	435.5
2556.23	435.62	2573.8	435.73	2574.03	435.73	2574.52	435.72	2586.49	435.61
2591.92	435.58	2598.96	435.6	2614.49	435.6	2623.84	435.58	2628.15	435.62
2636.25	435.81	2646.26	435.91	2648.61	435.9	2653.85	435.96	2660.78	436.02
2663.83	436.06	2673.18	436.04	2681.95	435.98	2685.65	435.97	2698.12	435.9
2700.06	435.88	2710.58	435.85	2718.18	435.85	2723.05	435.81	2733.79	435.76
2735.5	435.75	2736.29	435.74	2747.67	435.54	2753.86	435.48	2759.94	435.38
2771.98	435.29	2773.15	435.29	2784.81	435.18	2797.27	435.04	2808.21	434.89
2809.74	434.88	2813.12	434.89	2826.32	434.9	2834.4	434.93	2843.89	434.94
2846.6	434.93	2852.48	434.96	2859.04	434.98	2862.01	434.97	2871.5	434.96
2880.12	434.98	2892.45	435.04	2896.43	435.05	2898.24	435.07	2916.35	434.77
2921.26	434.68	2932.42	434.52	2933.46	434.51	2933.92	434.5	2952.04	434.55
2958.26	434.65	2970.15	434.77	2970.67	434.78	2971.78	434.79	2983.13	434.92
2988.27	434.96	3006.38	435.2	3008.02	435.23	3020.19	435.49	3023.95	435.6
3032.51	435.77	3042.07	436	3057.35	436.25	3060.18	436.29	3069.82	436.4
3078.3	436.52	3082.28	436.55	3094.75	436.71	3096.41	436.72	3106.99	436.82
3113.98	436.87	3119.3	436.95	3131.05	437.16	3131.77	437.17	3132.1	437.17
3144.17	437.48	3156.58	437.82	3168.98	438.19	3170.41	438.23	3181.44	438.58
3186.44	438.69	3204.01	438.93	3206	438.94	3218.42	439.05	3222.13	439.04
3230.83	438.94	3240.24	438.92	3243.24	438.88	3255.67	438.66	3258.36	438.62
3268.14	438.74	3276.47	438.63	3280.52	438.6	3292.72	438.53	3294.04	438.5
3305.16	438.37	3317.62	438.27	3329.68	438.43	3330.09	438.44	3330.27	438.44
3342.49	438.29	3348.39	438.29	3354.9	438.2	3366.5	438.23	3367.29	438.22
3369.04	438.21	3379.48	438.13	3384.07	438.13	3391.85	438.2	3402.19	438.16
3404.31	438.16	3409.01	438.05	3416.74	437.93	3420.3	437.54	3429.15	436.75
3438.42	436.43	3441.55	436.19	3448.37	436.12	3453.99	436.01	3456.53	435.89
3466.25	435.51	3474.1	435.3	3478.54	435.31	3488.34	435.44	3491.01	435.47
3492.22	435.49	3503.47	435.78	3510.33	435.97	3528.31	436.64	3528.45	436.65
3546.56	437.43	3553.08	437.7	3564.13	438.28	3565.25	438.32	3577.7	438.98
3582.25	439.5	3590.17	440.53	3600.36	442.08	3602.63	442.5	3607.64	443.56
3615.06	445.11	3618.48	446.45	3627.47	450.49	3636.59	453.78	3639.81	454.45
3647	456.64	3651.97	458.03	3654.16	458.45	3664.39	460.21	3672.28	461.27
3676.86	462	3686.97	464.12	3689.32	464.59	3689.76	464.7	3694.09	466.39
3696.83	466.8	3697.34	466.76	3697.71	466.72	3698.35	466.71		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1383.82	.04	1513	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1383.82	1513	690	501	980	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2597

INPUT
Description:
Station Elevation Data num= 461

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.14	14.23	434.39	20.54	433.81	40.1	432.6	41.54	432.48
46.53	432.01	62.22	430.48	66.77	430.13	83.22	430.09	93.45	430.04
103.9	430.21	120.12	430.24	124.9	430.22	145.9	430.39	146.8	430.4
166.58	430.56	172.66	430.62	187.58	430.95	191.94	431.07	196.52	431.22
200.27	431.29	213.03	431.64	217.35	431.7	229.54	431.98	234.43	432.1
246.05	432.16	251.33	432.15	262.05	432.25	268.06	432.32	278.56	432.34
295.07	432.13	302.22	432.09	311.58	432.22	319.29	432.26	328.09	432.17
336.11	432.21	352.93	432.19	360.61	432.2	377.12	432.35	404.16	432.44
410.13	432.41	420.89	432.54	426.14	432.53	437.8	432.46	442.65	432.49
454.88	432.4	471.95	432.36	475.67	432.38	489.03	432.4	492.18	432.4
505.67	432.54	508.19	432.55	522.67	432.59	524.69	432.6	539.74	432.79
541.2	432.8	556.82	433.16	557.71	433.17	573.9	433.06	574.22	433.06
590.23	433.21	590.45	433.21	606.74	433.52	607.52	433.52	623.25	433.44
624.59	433.45	639.76	433.3	641.66	433.32	656.27	433.55	658.65	433.55
672.27	433.68	675.28	433.65	688.78	433.38	709.41	433.26	721.8	433.37
726.48	433.36	743.39	433.22	754.32	433.11	760.1	433.13	770.83	433.15
777.17	433.14	787.34	433.18	794.24	433.18	803.84	433.26	811.3	433.23
836.36	433.07	844.92	432.99	852.87	432.94	869.38	432.77	879.06	432.77
885.89	432.74	896.13	432.79	902.4	432.7	912.86	432.85	918.41	433.03
929.75	432.99	934.91	432.98	946.81	432.93	951.42	432.96	963.88	432.89
980.95	432.72	984.44	432.7	997.59	432.65	1000.45	432.65	1014.57	432.73
1016.96	432.72	1031.64	432.6	1048.71	432.5	1049.98	432.49	1065.77	432.58
1066.49	432.58	1082.33	432.7	1082.49	432.71	1099	432.64	1099.39	432.64
1115.51	432.46	1116.46	432.47	1132.02	432.76	1133.53	432.77	1148.53	432.85
1150.53	432.85	1164.54	432.87	1167.15	432.91	1181.05	433.01	1184.22	433.05
1197.56	433.42	1230.57	433.74	1246.58	433.93	1251.97	433.97	1263.09	434.1
1269.04	434.21	1279.6	434.32	1286.11	434.2	1296.11	434.13	1303.18	433.99
1312.62	433.9	1328.63	433.95	1345.14	434.16	1353.86	434.38	1370.93	434.51
1378.15	434.58	1388	434.48	1394.66	434.39	1404.74	434.4	1410.67	434.47
1421.62	433.65	1434	433.09	1438.49	432.17	1460	425	1550	425
1572.97	432.66	1573.54	432.65	1574.74	432.64	1590.23	432.57	1591.24	432.56
1606.95	432.63	1607.74	432.63	1623.67	432.72	1624.24	432.72	1640.39	432.83
1640.74	432.83	1656.62	432.85	1673.25	432.83	1673.34	432.83	1689.75	432.9
1690.06	432.9	1706.25	432.95	1706.79	432.95	1722.75	432.82	1723.49	432.82
1738.75	432.8	1739.73	432.79	1755.25	432.7	1756.46	432.7	1771.76	432.6
1773.19	432.57	1788.26	432.49	1795.72	432.49	1800.41	432.5	1804.02	432.5
1805.42	432.51	1816.51	432.57	1829.11	432.67	1841.85	432.74	1845.82	432.77
1854.59	432.86	1858.02	432.86	1875.73	432.94	1880.08	432.99	1891.22	433.1
1892.81	433.12	1893.44	433.12	1905.23	433.26	1910.61	433.3	1917.8	433.33
1928.32	433.31	1930.48	433.3	1943.2	433.3	1955.94	433.44	1963.75	433.46
1981.34	433.3	1981.46	433.3	1993.83	433.24	2016.34	433.36	2019.1	433.36
2026.05	433.57	2031.81	433.68	2034.05	433.74	2044.55	433.95	2051.76	434.13
2057.29	434.18	2069.48	434.31	2070.02	434.29	2071.46	434.24	2082.48	433.77
2086.65	433.63	2095.13	433.46	2104.36	433.07	2107.87	432.98	2120.59	432.97
2122.07	432.96	2123.93	432.9	2125.4	432.88	2168.32	431.7	2181.53	431.68
2197.44	431.53	2246.91	431.46	2297.1	431.03	2297.82	431.01	2298.11	431.01
2310.56	431.12	2315.82	431.18	2323.31	431.12	2333.53	431.18	2335.99	431.16
2342.5	431.21	2348.43	431.22	2350.7	431.21	2361.06	431.14	2373.75	431.15
2386.12	431.12	2387.22	431.12	2399.17	431.08	2403.84	431.01	2411.91	430.99
2421.55	431.1	2424.59	431.11	2432.62	431.25	2437.03	431.32	2438.72	431.3
2449.68	431.71	2456.43	431.73	2462.26	431.67	2487.78	430.84	2491.85	430.94
2500.52	431.03	2509.56	430.99	2513.18	430.95	2522.74	430.8	2525.64	430.76
2526.74	430.75	2538.36	430.5	2544.45	430.45	2562.16	430.4	2563.84	430.4
2568.14	430.42	2576.54	430.43	2589.23	430.58	2601.82	430.63	2614.76	430.62
2626.96	430.68	2632.47	430.77	2639.71	430.84	2650.18	430.92	2652.45	430.95
2658.26	431.07	2665.16	431.18	2667.89	431.21	2677.84	431.27	2685.6	431.34
2690.42	431.37	2702.77	431.56	2702.98	431.56	2728.31	431.68	2748.38	431.62
2755.91	431.62	2773.62	431.65	2779.15	431.67	2790.79	431.68	2791.63	431.69
2793.78	431.7	2808.5	431.82	2817.01	431.87	2826.21	431.88	2829.7	431.89
2842.4	431.86	2843.92	431.87	2861.64	431.93	2867.75	431.99	2880.24	432.25
2892.94	432.4	2896.52	432.45	2918.31	432.49	2928.62	432.56	2931.01	432.58
2931.94	432.59	2943.75	432.67	2966.83	432.75	2968.85	432.79	2974.02	432.84
2981.59	432.95	2984.54	432.95	2994.33	432.97	3002.25	432.96	3007.07	432.99
3019.43	432.94	3019.96	432.94	3032.5	432.91	3037.67	432.91	3045.02	432.69
3054.85	432.45	3057.48	432.39	3064.14	432.19	3070.2	432.03	3078.01	431.98
3096.66	432.03	3106.98	432.18	3107.98	432.19	3121.11	432.19	3125.69	432.07
3133.62	431.92	3142.86	431.98	3146.1	432.06	3154.26	431.96	3158.8	431.92
3160.57	431.93	3171.54	431.96	3178.29	432.09	3184.28	431.96	3196	431.8
3199.66	431.69	3209.77	431.41	3213.71	431.33	3222.31	431.27	3230.88	430.99
3234.86	431.02	3245.07	431	3247.59	431.02	3248.59	431	3260.28	431.35
3266.3	431.33	3272.96	431.35	3284.01	431.64	3285.65	431.68	3289.78	431.81
3298.37	432.02	3301.72	432.12	3310.91	432.12	3318.9	432.24	3323.47	432.22
3335.19	432.31	3336.21	432.32	3337.54	432.32	3372.03	432.35	3374.26	432.34
3379.9	432.3	3386.98	432.23	3389.74	432.22	3399.5	432.15	3406.92	432.12
3412.08	432.08	3424.63	431.93	3424.82	431.93	3425.3	431.92	3442.34	431.81
3450.3	431.78	3460.05	431.77	3463.04	431.76	3488.21	432.14	3494.93	432.25
3500.75	432.27	3512.64	432.24	3513.43	432.24	3515.42	432.27	3526.16	432.39
3530.35	432.46	3538.91	432.64	3548.07	432.73	3556.99	432.78	3560.83	432.81
3638.52	433.16	3640.25	433.16	3650.94	433.18	3652.99	433.19	3665.47	433.19
3670.97	433.22	3688.68	433.2	3690.83	433.21	3703.54	433.38	3706.39	433.43
3716.23	433.67	3724.1	433.79	3741.06	434.01	3741.81	434.01	3758.99	434.14

3766.7	434.17	3776.7	434.3	3786.47	434.48	3792.16	434.56	3794.41	434.57
3804.84	434.72	3812.12	434.67	3817.53	434.57	3830.21	434.56	3831.18	434.57
3842.66	434.63	3855.31	434.71	3864.71	434.74	3868.05	434.71	3876.59	434.41
3880.79	434.29	3882.43	434.19	3893.53	433.42	3900.14	432.95	3906.27	432.72
3917.85	432.66	3918.98	432.71	3921.99	432.99	3931.41	433.94	3935.02	434.24
3944.01	434.97	3952.73	435.27	3956.7	435.38	3966.71	436.05	3969.39	436.2
3970.44	436.29	3982.14	436.81	3988.15	437.36	3994.88	438.09	4005.87	439.54
4007.58	439.88	4012.11	440.56	4020.01	441.91	4023.04	442.56	4032.62	444.75
4040.75	446.25	4045.31	446.94	4056.82	448.58	4058	448.75	4058.46	448.81
4076.17	453.01	4093.88	455.59	4096.17	456	4111.06	458.83	4121.32	460.43
4128.77	461.29	4134.06	462.15	4146.48	463.12	4146.8	463.16	4147.63	463.04
4154.29	461.97								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1434	.04	1572.97	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1434	1572.97	760	500	410	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2069	3842	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2097

INPUT
Description:
Station Elevation Data num= 436

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.08	8.65	435.23	17.96	434.13	25.15	432.93	34.18	431.92
41.65	430.74	50.14	430.13	57.66	429.98	66.13	430.05	74.16	430.38
82.36	430.39	90.66	430.57	123.67	430.48	130.81	430.64	139.67	431.04
146.76	431.27	156.17	431.65	162.98	431.74	172.67	431.83	179.2	432.02
189.18	432.13	195.43	432.42	205.68	432.92	211.47	433.17	221.68	433.58
238.18	433.96	243.6	434.03	254.68	434.11	266.15	434.14	276.05	434.37
287.69	434.39	292.14	434.24	303.69	434.21	308.01	434.18	320.19	434.23
324.23	434.21	336.7	434.17	340.45	434.18	353.2	434.24	356.68	434.24
372.8	434.13	385.7	434.12	388.63	434.1	402.21	434.06	421.08	434.19
437.3	434.29	451.71	434.4	453.47	434.4	484.22	434.59	517.92	434.59
533.72	434.65	549.73	434.67	599.23	434.65	630.56	434.71	648.24	434.71
664.74	434.93	679.2	435.01	681.25	435.03	695.43	434.85	697.75	434.83
713.75	434.55	727.39	434.58	730.25	434.57	746.76	434.62	763.26	434.55
776.08	434.43	779.76	434.41	791.93	434.37	795.76	434.35	812.26	434.34
824.27	434.48	828.77	434.54	840.49	434.6	845.27	434.64	861.77	434.69
872.62	434.68	877.77	434.65	888.68	434.67	921.14	434.62	927.28	434.63
937.37	434.58	953.3	434.32	959.79	434.26	969.33	434.23	976.29	434.19
985.56	434.17	992.79	434.13	1009.29	433.83	1018.01	433.69	1033.99	433.51
1041.8	433.52	1049.97	433.5	1074.8	433.18	1082.43	433.2	1091.3	433.18
1107.81	433.26	1114.67	433.27	1123.81	433.23	1130.62	433.24	1140.31	433.17
1146.85	433.14	1156.81	433.02	1163.07	432.99	1173.32	433.06	1179.3	433.13
1189.82	433.29	1195.36	433.36	1205.82	433.52	1211.26	433.57	1222.32	433.69
1227.49	433.76	1238.83	433.94	1243.72	433.97	1255.33	434.09	1259.95	434.09
1276.04	434.05	1287.83	434.08	1291.91	434.14	1304.34	434.28	1320.84	434.37
1324.36	434.36	1337.34	434.22	1340.59	434.15	1353.84	433.72	1369.84	433.17
1372.55	433.11	1386.35	432.92	1405.01	432.82	1419.35	432.78	1421.23	432.73
1437.41	432.24	1451.86	431.85	1453.2	431.83	1456	430.99	1477.77	430.83
1499	423.75	1589	423.75	1615.26	432.5	1617.74	432.51	1631.67	432.5
1640.07	432.41	1652.64	432.45	1665.24	432.41	1678.22	432.41	1684.85	432.37
1691.2	432.36	1702.25	432.42	1704.14	432.42	1719.13	432.6	1729.83	432.71
1736.53	432.64	1742.86	432.52	1753.94	432.33	1755.89	432.31	1761.69	432.33
1768.92	432.34	1771.34	432.33	1781.95	432.23	1788.75	432.23	1794.84	432.26
1805.63	432.27	1823.03	432.1	1833.6	432.04	1840.44	431.96	1846.58	431.92
1857.84	431.96	1864.6	432.05	1875.25	432.24	1885.36	432.29	1892.12	432.24
1898.24	432.25	1909.53	432.32	1911.27	432.41	1916.45	432.49	1926.93	432.71
1937.25	433.05	1944.34	433.1	1950.23	432.9	1961.74	432.76	1967.51	432.65
1975.89	432.47	1978.62	432.46	1988.86	432.46	1996.03	432.4	2001.89	432.4
2013.43	432.38	2027.95	432.17	2030.83	432.15	2040.98	432.28	2048.24	432.31
2053.88	432.27	2065.12	432.26	2071.2	432.21	2079.64	432.12	2082.52	432.12
2092.62	432	2099.93	431.85	2105.6	431.66	2117.33	431.08	2118.59	431.06
2131.6	431.09	2134.74	431.09	2151.61	431.22	2157.27	431.3	2169.02	431.39
2170.3	431.41	2183.29	431.48	2203.83	431.48	2209.26	431.44	2221.23	431.39
2234.93	431.35	2238.11	431.35	2272.92	431.29	2290.33	431.24	2300.01	431.24
2307.73	431.2	2312.92	431.19	2324.61	431.24	2338.67	431.14	2351.65	431.08
2359.42	431.02	2364.63	431.01	2376.82	431.03	2390.63	431.11	2403.45	431.27
2416.3	431.32	2429.33	431.4	2442.32	431.3	2445.92	431.29	2463.32	431.27
2468.28	431.29	2481.25	431.28	2493.98	431.32	2497.6	431.38	2506.92	431.46
2532.41	431.58	2532.98	431.59	2546.01	431.6	2549.82	431.61	2559.04	431.67
2567.22	431.68	2584.1	431.75	2597.7	431.75	2601.5	431.71	2610.68	431.46
2636.31	431.28	2649.67	431.26	2653.72	431.29	2661.5	431.41	2685.2	431.52
2688.36	431.56	2701.35	431.89	2705.41	431.85	2714.33	431.71	2722.81	431.83
2727.31	431.82	2740.5	431.91	2765.95	431.73	2774.5	431.71	2791.68	431.79
2805.05	431.87	2817.88	431.75	2826.71	431.75	2831.01	431.74	2844.19	431.84
2861	431.92	2869.7	431.73	2895.81	431.69	2908.7	431.86	2913.21	431.93
2934.36	432.32	2947.1	432.44	2964.9	432.41	2973.35	432.38	2982.3	432.33

2999.71	432.13	3002.73	432.13	3025.99	432.1	3040.42	432.02	3050.01	432.11
3051.4	432.11	3064.08	431.77	3068.8	431.82	3077.11	431.96	3086.21	431.95
3101.85	432.01	3115.75	431.97	3120.49	432.02	3137.89	432.05	3152.91	430.66
3155.3	430.43	3172.7	430.43	3180.58	430.69	3189.58	430.88	3193.4	430.93
3206.99	431.26	3219.4	431.52	3224.39	431.57	3232.38	431.58	3245.36	431.53
3258.35	431.54	3259.2	431.53	3271.1	431.5	3276.08	431.48	3284.02	431.39
3307.67	431.48	3310.89	431.48	3323.11	431.45	3336.14	431.39	3345.7	431.28
3349.09	431.25	3359.52	431.3	3364.16	431.28	3379.98	431.17	3397.38	430.98
3400.74	430.92	3410.58	430.82	3414.79	430.8	3426.76	430.72	3432.19	430.6
3439.62	430.53	3449.07	430.59	3452.43	430.69	3462.42	430.63	3466.48	430.66
3478.43	430.83	3483.88	430.87	3504.39	431.13	3517.38	431.23	3518.69	431.26
3530.15	431.4	3535.57	431.45	3543.05	431.38	3552.97	431.33	3556.08	431.33
3565.33	431.26	3570.38	431.24	3587.78	431.26	3595.17	431.23	3605.19	431.23
3608.13	431.26	3620.85	431.3	3633.8	431.28	3639.47	431.35	3646.78	431.46
3656.88	431.47	3659.77	431.49	3674.28	431.5	3685.79	431.44	3698.66	431.31
3720.09	431.29	3725.97	431.3	3737.45	431.38	3743.37	431.38	3750.43	431.42
3760.78	431.43	3763.41	431.42	3776.41	431.48	3789.19	431.32	3812.46	431.12
3815.11	431.12	3847.27	431.25	3864.68	431.22	3879.89	431.14	3892.83	431.14
3898.96	431.2	3905.81	431.22	3918.79	431.23	3931.79	431.13	3933.77	431.1
3944.82	431.11	3951.18	431.14	3957.7	431.14	3968.05	431.18	3970.49	431.17
3983.5	431.16	3985.46	431.14	4020.27	431.04	4035.45	430.99	4037.67	430.97
4048.23	430.8	4061.11	430.73	4071.96	430.64	4074.14	430.63	4087.17	430.52
4089.36	430.48	4100.2	430.23	4106.77	430.2	4113.23	430.07	4124.17	430.96
4126.22	431.15	4132.5	431.34	4138.93	431.56	4141.05	431.73	4151.86	432.87
4158.45	433.11	4164.84	433.31	4177.82	433.54	4183.56	433.59	4193.26	433.69
4203.86	433.84	4210.67	433.96	4216.74	434.09	4229.52	434.39	4242.52	434.61
4244.95	434.69	4255.51	435.1	4262.35	435.52	4276.29	436.85	4279.76	437.1
4281.47	437.32	4286.47	438.22	4294.48	439.63	4297.16	440.18	4307.27	443
4314.04	444.8	4320.14	446.35	4331.45	449.13	4333.17	449.47	4346.2	452.36
4348.85	453.01	4359.23	455.1	4366.26	456.5	4372.27	457.89	4383.66	461
4385.26	461.53	4390.16	462.71	4397.96	464.72	4400.54	465.02	4410.88	465.76
4417.94	465.67	4423.86	465.02	4435.35	463.54	4436.84	463.33	4443.7	462.73
4444.4	462.77								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1477.77	.04	1615.26	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1477.77	1615.26	460	497	900	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
280	1320	436	F
1944	3775	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1600

INPUT
Description:
Station Elevation Data num= 438

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.32	2.04	436.18	18.54	433.35	26.39	431.64	35.04	429.99
51.54	427.75	59.58	428.01	68.04	428.15	75.93	428.7	84.04	429.35
92.27	429.5	100.54	429.61	117.04	429.58	133.54	429.8	142.06	430.15
150.04	430.41	158.39	431.02	166.04	431.61	174.75	432.16	182.54	432.52
191.35	432.77	199.04	433.2	215.54	433.45	224.54	433.45	240.86	433.63
248.04	433.66	257.23	433.62	264.54	433.72	273.83	433.74	281.04	433.7
290.43	433.72	297.54	433.8	307.02	433.81	323.33	433.76	330.04	433.78
339.71	433.88	346.54	433.87	356.31	433.76	363.04	433.72	372.91	433.72
379.54	433.69	389.5	433.67	396.04	433.6	405.79	433.55	412.04	433.57
428.54	433.36	438.79	433.2	445.04	433.08	455.39	433.08	461.54	433.05
471.99	432.89	478.04	432.82	494.04	432.58	510.54	432.5	521.27	432.54
527.04	432.61	543.55	433.17	554.47	433.26	560.05	433.28	570.73	433.43
576.05	433.54	587.16	433.46	592.55	433.36	609.05	433.23	620.35	433.02
625.55	432.88	636.95	432.73	653.19	432.65	658.05	432.64	669.64	432.53
686.24	432.28	691.05	432.19	702.83	432.1	707.55	432.11	719.43	432.35
724.05	432.42	735.66	432.71	740.05	432.78	752.12	432.88	756.55	432.9
773.05	433.03	785.31	433.1	789.55	433.16	806.05	433.36	822.05	433.52
834.6	433.66	838.55	433.69	855.05	433.72	871.55	433.51	888.05	432.95
900.6	432.46	904.05	432.34	917.08	432.38	920.55	432.38	933.68	432.8
937.05	432.89	953.55	433.06	970.05	433.14	983.06	433.35	986.05	433.38
1002.55	433.62	1016.16	433.97	1019.05	434.02	1032.76	434.17	1035.55	434.22
1052.05	434.37	1068.05	434.41	1082.05	434.62	1101.05	434.99	1117.55	435.43
1131.84	435.66	1150.06	436.07	1166.56	436.22	1181.12	436.32	1183.06	436.35
1197.72	436.44	1214.32	436.56	1232.06	436.65	1249.82	436.68	1257.04	436.66
1270.87	436.66	1281.44	436.59	1287.05	436.57	1293.61	436.5	1305.99	436.44
1317.75	436.31	1323.71	436.28	1329.86	436.2	1341.65	436.16	1354.32	435.7
1360.93	435.39	1366.55	435.1	1379.54	434.22	1390.94	433.83	1398.16	433.57
1403	433.31	1412.43	432.97	1414.94	432.92	1427.14	433.02	1434.82	432.96
1439.37	432.86	1453.43	432.93	1463.75	432.67	1472.04	432.43	1475.91	432.4
1488.1	432.36	1490.65	432.37	1500.14	432.29	1508.7	432.33	1513.21	432.26
1525.28	432.14	1541.78	432.23	1546.64	432.22	1558.28	432.27	1561	432.48
1581	432.28	1596	428.55	1604.5	425.23	1614	422.75	1704	422.75
1730.57	431.61	1731.63	431.57	1745.65	431.33	1764.47	431.33	1773.59	431.14

1784.61	431.08	1796.25	430.85	1804.89	430.7	1814.59	430.7	1821.26	430.8
1823.67	430.76	1830.71	430.85	1892.63	431.85	1907.82	431.88	1917.09	431.86
1930.3	431.92	1946.12	431.93	1952.96	431.97	1962.73	431.99	1985.47	432.14
1998.61	432.15	2010.7	432.17	2015.16	432.21	2036.17	432.24	2050.47	432.17
2061.74	432.25	2068.13	432.18	2073.63	432.17	2093.82	432.17	2099.83	432.13
2113.15	432.49	2121.19	432.64	2138.22	434.15	2155.87	434.61	2164.19	434.84
2173.53	435.08	2184.72	435.13	2188.83	435.26	2216.38	432.37	2263.44	432.45
2282.5	432.42	2293.34	432.43	2313.71	432.41	2331.37	432.25	2349.02	432.25
2366.15	432.02	2417.61	432.46	2419.12	432.48	2436.77	432.48	2459.36	431.97
2468.19	431.69	2471.55	431.69	2489.21	431.99	2493.76	432.04	2505.72	431.99
2506.86	432	2519.33	432.57	2524.52	432.52	2531.95	432.48	2541.64	432.52
2544.52	432.44	2552.07	432.4	2557.28	432.35	2570.01	432.33	2576.95	432.29
2594.61	432.45	2608.26	432.61	2620.85	432.63	2633.44	432.61	2647.04	432.67
2658.95	432.55	2671.68	432.55	2684.41	432.59	2697.18	432.54	2700.01	432.54
2709.74	432.49	2717.13	432.49	2722.36	432.45	2734.79	432.49	2760.72	432.46
2773.51	432.51	2787.76	432.5	2798.76	432.45	2811.36	432.45	2822.54	432.4
2836.86	432.37	2849.65	432.42	2862.43	432.45	2875.51	432.58	2887.67	432.61
2910.28	432.49	2920.11	432.4	2925.78	432.32	2927.94	432.32	2938.57	432.24
2951.35	432.2	2966.47	432.14	2976.62	432.08	2980.37	432.08	2998.03	432.14
3012.83	432.36	3027.62	432.64	3033.34	432.78	3046.78	432.62	3071.06	432.29
3103.1	432.6	3104.84	432.59	3118.47	432.26	3153.01	433.5	3154.4	433.61
3155.87	433.5	3169.84	433.33	3173.52	433.27	3187.7	432.66	3191.18	432.48
3196.85	432.51	3205.53	432.64	3208.84	432.64	3218.32	432.7	3226.49	432.77
3256.23	432.79	3261.27	432.85	3268.96	432.74	3278.93	432.77	3288.86	432.76
3294.45	432.73	3296.58	432.64	3307.24	432.53	3314.24	432.57	3319.9	432.49
3331.36	432.46	3335.21	432.47	3345.17	432.57	3349.02	432.55	3357.9	432.64
3370.63	432.66	3384.33	432.83	3396.16	432.86	3408.79	432.96	3419.11	433.96
3421.35	433.99	3427.22	435.43	3434.13	436.92	3436.76	436.92	3439.03	436.43
3442.71	436.27	3485.01	433.43	3492.47	433.07	3506.85	433.07	3524.51	432.99
3535.84	433.06	3542.17	433.03	3559.82	433.09	3565.59	432.99	3577.48	432.7
3586.69	432.51	3594.6	432.48	3599.24	432.54	3611.24	432.66	3629.91	433.02
3647.57	433.2	3650.34	433.25	3663.12	433.36	3675.67	433.34	3682.35	433.31
3688.31	433.31	3700	433.38	3717.66	433.44	3735.32	433.47	3739.3	433.5
3752.97	433.54	3764.57	433.5	3770.09	433.54	3777.23	433.55	3790.02	433.43
3795.96	433.43	3805.41	433.39	3823.06	433.33	3828.24	433.39	3841.62	433.35
3853.46	433.41	3857.84	433.41	3875.5	433.24	3887.97	433.26	3904.51	433.3
3917.3	433.38	3928.47	433.4	3934.33	433.35	3945.59	433.22	3955.18	433.03
3963.24	432.94	3980.9	432.88	3993.43	432.93	4006.22	433.03	4026.34	433.1
4031.43	433.11	4044.11	433.22	4056.85	433.25	4068.65	433.24	4082.35	433.14
4086.3	433.13	4103.96	433.24	4121.08	433.3	4133.11	433.31	4158.68	433.12
4171.44	433.08	4174.05	433.06	4184.17	433.1	4191.71	433.16	4196.79	433.22
4208.83	433.33	4222.03	433.4	4226.48	433.38	4234.82	433.44	4247.61	433.38
4261.79	433.35	4273.11	433.18	4279.45	433.12	4285.7	433.14	4296.57	433.13
4302.37	433.15	4314.23	433.16	4323.74	433.02	4348.72	433.08	4362.1	433.07
4367.2	433.04	4387.29	433.05	4401.98	433	4419.63	432.73	4425.52	432.66
4440.73	432.57	4451.02	432.48	4454.94	432.48	4463.61	432.4	4472.07	432.16
4476.21	431.99	4487.09	431.7	4488.99	431.61	4501.72	430.51	4507.38	429.85
4514.45	428.93	4525.04	429.42	4527.19	429.43	4532.74	430.12	4539.95	430.88
4552.51	432.9	4559.81	433.66	4565.13	434.42	4577.47	435.03	4590.71	435.43
4603.49	435.85	4612.78	436.06	4616.28	436.12	4630.44	436.28	4641.53	436.39
4647.56	436.5	4654.13	436.67	4666.86	437.19	4679.63	438.12	4682.87	438.51
4692.41	439.8	4700.53	441.99	4705.2	443.3	4718.19	446.37	4730.44	449.57
4735.31	450.92	4743.06	453.26	4752.96	456.67	4763.12	460.37	4768.55	462.37
4770.62	462.94	4781.34	465.4	4788.27	465.61	4794.12	465.66	4805.93	464.69
4811.01	464.19	4814.68	463.42	4826.65	463.33				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1581	.04	1730.57	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1581	1730.57	700	502	530	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
340	1250	438	F
2173	4248	438	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1098

INPUT
Description:
Station Elevation Data num= 442

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.02	13.11	433.96	29.61	430.92	46.11	428.9	62.69	428.9
79.12	429.17	95.12	429.51	128.13	429.27	146.54	429.46	177.14	429.87
179.77	429.88	193.65	430.01	196.64	430.11	210.15	430.39	213.52	430.39
226.66	430.48	243.16	430.7	247.13	430.73	259.16	430.9	263.62	431.11
275.67	431.57	280.49	431.99	292.17	432.68	297.36	432.78	308.68	433.2
314.23	433.23	325.18	433.19	330.92	433.12	347.47	433.16	357.69	433.11
374.19	433.18	381.21	433.25	390.69	433.23	398.08	433.24	407.2	433.39
423.2	433.31	431.31	433.35	439.71	433.45	456.21	433.7	472.71	433.77
481.93	433.97	489.22	434.09	498.5	434.29	505.22	434.35	515.16	434.3
521.73	434.33	532.03	434.2	548.91	434.13	554.73	434.13	565.78	434.28
571.24	434.32	582.3	434.36	587.24	434.4	599.01	434.37	603.75	434.34

615.88	434.22	632.75	434.07	653.26	434.04	669.26	433.94	685.76	433.72
716.6	433.58	733.47	433.55	751.28	433.49	766.7	433.59	784.29	433.63
800.45	433.42	817.3	433.32	833.68	433.32	867.42	432.87	882.81	432.8
884.3	432.9	901.11	433.83	915.32	434.78	917.53	434.82	931.82	435.18
951.27	435.27	964.83	435.31	968.14	435.35	981.34	435.39	997.34	435.7
1001.37	435.76	1013.84	435.88	1018.25	435.87	1030.35	435.94	1046.85	436.18
1063.35	436.39	1079.36	436.43	1085.22	436.36	1102.09	436.36	1118.96	436.47
1128.87	436.55	1135.84	436.68	1145.37	436.81	1152.48	436.95	1185.94	437.52
1210.89	437.71	1219.68	437.56	1227.39	437.49	1236.27	437.19	1243.4	437.03
1252.92	436.97	1259.9	436.86	1269.79	436.76	1276.41	436.63	1286.66	436.34
1292.91	436.19	1303.53	435.99	1309.41	435.93	1320.06	435.77	1336.76	435.57
1341.92	435.49	1353.64	435.45	1370.51	435.45	1374.93	435.48	1387.38	435.19
1391.43	435.08	1403.85	434.94	1407.44	434.92	1420.61	434.1	1423.94	433.95
1440.44	432.74	1454.36	432.85	1456.95	432.83	1471.23	431.98	1487.65	431.78
1489.46	431.72	1504.46	430.99	1505.96	430.95	1516	430.07	1545	427.65
1551	425.31	1555.12	424.38	1557.87	423.46	1563	421.75	1653	421.75
1678.86	430.37	1681.8	430.31	1686.99	430.16	1696.14	430.35	1703.72	430.34
1710.47	430.19	1724.69	430.19	1736.67	430.22	1738.71	430.3	1753.04	430.26
1767.38	430.71	1770.13	430.73	1781.72	430.6	1786.86	430.68	1796.05	430.7
1803.58	430.76	1810.21	431.1	1819.92	431.34	1823.68	431.34	1837.05	431.05
1850.44	431.19	1863.79	431.2	1877.15	431.3	1888.43	431.28	1905.03	431.1
1922.16	431.15	1930.27	431.26	1943.67	431.36	1959.41	431.53	1970.43	431.68
1983.54	431.64	1990.15	431.66	1996.73	431.58	2007.27	431.77	2020.04	431.83
2023.45	431.82	2036.85	431.68	2041.53	431.65	2050.25	431.38	2058.65	431.45
2063.53	431.56	2076.64	431.51	2090.04	431.62	2103.44	431.34	2116.84	431.4
2130.24	431.39	2143.77	431.57	2156.68	431.67	2160.38	431.59	2177.5	431.61
2183.29	431.56	2196.65	431.55	2211.75	431.67	2223.42	431.59	2228.88	431.62
2236.63	431.59	2249.82	431.71	2262.62	431.7	2276.58	431.55	2279.74	431.54
2289.93	431.58	2296.87	431.57	2303.29	431.6	2316.58	431.53	2330.6	431.84
2347.73	431.84	2356.4	431.59	2364.86	431.37	2369.8	431.34	2381.98	431.32
2383.2	431.35	2396.6	431.36	2399.11	431.39	2409.74	431.84	2415.72	432.12
2422.99	432.28	2432.84	432.47	2436.39	432.41	2449.97	431.99	2463.14	431.89
2474.17	431.64	2484.22	431.12	2500.83	431.68	2502.8	431.73	2509.76	431.68
2516.17	431.68	2517.96	431.73	2537.04	432.64	2552.21	432.47	2556.37	432.37
2569.34	432.51	2582.8	432.45	2596.08	432.19	2603.07	432.36	2609.43	432.37
2620.2	432.52	2626.41	432.48	2631.96	432.48	2671.75	432.06	2688.18	432.17
2716.14	432.17	2722.44	432.15	2742.86	432.04	2773.3	432.05	2782.64	431.96
2796	432.15	2807.55	432.03	2809.35	432.05	2824.68	432.04	2835.85	432.14
2841.28	432.14	2849.12	432.24	2858.41	432.48	2875.54	432.56	2889.28	432.34
2892.66	432.36	2902.63	432.35	2909.79	432.37	2915.84	432.46	2926.4	432.49
2928.94	432.45	2943.53	432.46	2955.7	432.53	2960.65	432.62	2978.58	433.01
2981.26	433.05	2993.57	433.01	2997	433.15	3005.7	433.19	3014.86	432.84
3023.77	433.04	3030.09	433.23	3033.28	433.16	3051.71	433.2	3070.13	433.09
3088.55	433.21	3103.46	433.2	3106.41	433.18	3115.64	433.01	3124.84	433.06
3133.95	433.03	3143.26	432.96	3152.48	432.97	3164.79	432.88	3177.1	433
3180.1	432.96	3189.22	432.91	3197.97	432.92	3201.34	432.9	3213.63	432.99
3216.39	432.96	3234.81	432.94	3253.23	433.08	3262.71	433.01	3281.78	433.02
3289.52	432.97	3299.17	432.98	3307.94	433.17	3311.42	433.18	3323.7	433.07
3336.01	433.2	3344.79	432.89	3348.31	432.93	3355.42	432.95	3360.62	433.14
3381.07	433.13	3406.76	434.32	3421.65	434.77	3429.06	434.64	3433.92	434.47
3436.34	434.51	3446.23	434.52	3466.16	434.5	3472.62	434.51	3479.1	434.48
3509.47	433.5	3512.84	433.6	3521.53	433.62	3552.34	434.24	3568.08	433.64
3583.51	432.62	3593.48	431.83	3600.27	431.27	3621.92	433.32	3667.67	433.86
3674.15	433.97	3727.67	433.34	3763.5	434.26	3765.7	434.03	3767.18	433.99
3770.21	433.6	3784.13	432.78	3788.71	432.46	3797.81	432.39	3802.55	432.6
3813.29	433.16	3820.97	433.16	3825.5	433.33	3837.55	433.72	3849.77	433.84
3862.02	433.67	3874.28	434	3886.59	434.77	3894.1	435.12	3898.9	435.01
3908.55	435.16	3911.21	435.13	3923.29	434.73	3926.13	434.58	3937.67	434.28
3996.78	434.12	3999.7	434.04	4004.08	434.58	4009.02	434.51	4021.94	434.23
4033.3	434.24	4040.36	433.67	4043.46	433.33	4058.79	431.1	4063.66	430.86
4108.11	444.04	4117.99	444.52	4141.37	443.33	4149.18	442.86	4160.46	441.07
4205.05	440.12	4211.61	440.48	4223.47	441.84	4234.22	444.43	4265.24	442.08
4314.69	434.98	4323.89	434.74	4327.06	434.77	4333.44	434.76	4350.95	434.62
4363.87	434.65	4376.06	434.6	4388.05	434.74	4406.58	434.86	4425	434.86
4443.42	434.57	4449.48	434.52	4461.69	434.46	4473.85	434.42	4479.71	434.43
4486.04	434.4	4510.6	434.15	4516.55	434.12	4522.84	434.14	4535.32	434.12
4553.39	434.27	4571.26	434.29	4583.9	434.23	4596.14	434.25	4620.7	434.22
4633.01	434.12	4662.81	433.72	4681.23	433.38	4699.65	432.88	4719.7	432.22
4730.93	431.82	4736.5	431.71	4743.1	431.4	4755.17	430.97	4767.43	430.31
4779.67	430.09	4791.21	428.76	4804.22	427.73	4809.63	427.72	4816.53	428.05
4828.05	429	4828.83	429.04	4845.92	431.31	4853.09	432.2	4864.34	433.52
4865.4	433.7	4867.54	433.86	4877.66	434.77	4882.76	435.17	4901.18	436.18
4919.6	437.8	4926.62	437.97	4937.47	438.14	4950.96	438.58	4955.89	438.68
4963.21	439.45	4974.31	442.05	4977.72	442.56	4987.75	444.13	4992.74	444.87
5000.06	446.21	5011.16	448.64	5012.35	449.01	5014.82	450.05	5024.4	453.93
5029.02	456.2	5036.62	458.98	5047.44	462.02	5048.93	462.46	5051.92	463.17
5061.19	465.58	5073.44	465.15	5084.29	463.43	5088.85	462.62	5090.54	462.65
5091.15	462.52	5099.68	462.51						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.I	1545	.04	1678.86	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1545	1678.86	510	360	381	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2330	4108	438	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 738

INPUT
Description:
Station Elevation Data num= 446

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	434.97	8.43	433.71	24.06	429.99	25.28	429.72	29.91	429.31
42.12	428.3	45.28	428.45	58.97	428.95	66.47	429.3	75.81	429.79
87.22	429.51	108.99	429.11	125.83	429.53	142.68	430.06	159.52	430.34
171.58	430.86	175.86	430.99	192.7	431.16	213.89	431.3	226.39	431.23
235.09	431.32	243.23	431.35	255.79	431.49	274.74	431.45	276.84	431.43
293.26	431.59	298.04	431.67	310.1	431.65	319.24	431.78	339.92	431.83
343.28	431.88	356.77	431.95	361.01	431.95	376.97	432.54	382.29	432.51
393.81	432.95	403.57	433.02	410.66	432.44	424.31	432.97	426.99	432.95
437.55	432.99	445.46	432.92	460.68	432.56	466.66	432.46	487.85	432.04
494.37	432	510.7	432.01	519.57	432.15	526.17	432.29	540.11	432.48
544.39	432.48	561.23	432.34	567.98	432.22	581.82	432.13	611.26	431.71
628.1	431.5	635.27	431.43	656.47	431.3	661.79	431.29	678.12	431.15
682.38	431.14	711.81	431.22	719.42	431.22	740.62	431.37	745.5	431.42
760.66	431.67	767.94	431.89	778.46	432.25	795.15	433.12	811.85	433.52
820.07	433.57	828.55	433.67	839.49	433.53	844.74	433.42	859.12	433.64
861.44	433.65	873.8	434.1	878.93	434.26	894.83	434.68	911.53	434.79
927.72	434.99	937.64	435.05	944.42	435.14	957.41	435.14	977.82	435.44
994.52	435.33	1010.71	435.5	1016.22	435.54	1027.41	435.73	1044.1	435.89
1055.87	435.95	1077.5	436.01	1094.89	436.23	1127.09	436.57	1134.43	436.72
1143.78	436.86	1160.48	437.2	1176.67	437.36	1193.14	437.27	1210.07	437.29
1212.91	437.26	1226.77	437.22	1232.68	437.11	1243.47	436.85	1252.12	436.57
1259.66	436.36	1271.61	436.22	1276.36	436.1	1293.05	435.81	1309.75	435.76
1326.45	435.35	1342.64	435.26	1359.34	435.14	1376.04	435.06	1392.74	434.95
1409.43	434.73	1428.87	433.33	1442.3	431.88	1447.7	430.89	1458.83	429.19
1517.84	426.42	1534	421.03	1624	421.03	1642.79	427.29	1656.29	429.6
1659.55	429.83	1672.33	431.04	1676.89	431.05	1688.87	431.14	1705.41	430.51
1714.76	430.94	1729.98	431.3	1744.14	431.39	1754.87	431.37	1771.65	431.14
1786.3	431.08	1788.43	431.04	1800.47	431.02	1805.2	431.07	1814.64	431.09
1821.98	430.98	1828.63	430.84	1838.25	430.89	1842.55	430.84	1855.03	430.89
1885.01	430.94	1888.58	430.91	1899.15	430.98	1905.36	431.33	1913.08	431.6
1921.63	431.55	1938.4	431.9	1955.74	431.92	1969.44	432.05	1983.61	432.07
1988.73	432.11	2005	432.11	2011.52	432.16	2025.69	432.2	2038.55	432.28
2054.03	432.27	2072.11	432.35	2082.1	432.34	2105.15	432.18	2155.48	431.86
2166.6	431.91	2171.75	431.88	2180.6	431.93	2188.53	432.02	2208.87	431.96
2237.17	431.97	2238.86	431.96	2255.13	432.12	2265.08	432.24	2271.91	432.36
2279.25	432.37	2288.68	432.23	2293.42	432.3	2305.46	432.04	2319.15	435.05
2322.24	435.76	2335.54	433.57	2338.51	433.23	2349.6	432.51	2355.28	431.84
2363.73	431.69	2372.06	431.35	2377.87	431.27	2388.84	431.33	2406.13	431.21
2432.38	430.9	2438.66	430.71	2448.21	430.55	2455.44	430.33	2472.21	430.24
2476.55	430.36	2488.99	431.07	2490.68	431.06	2500.16	431.24	2505.26	431.3
2518.64	431.17	2522.03	431.25	2532.81	431.19	2538.81	431.19	2546.98	431.62
2555.59	432.69	2561.15	432.75	2572.37	433.24	2575.24	433.28	2588.63	432.09
2589.37	432.09	2611.84	431.11	2622.19	431.12	2627.19	431.03	2643.23	431.17
2672.01	431.98	2681.17	431.8	2701.77	431.3	2715.94	431.17	2722.34	431.18
2730.11	431.53	2739.12	431.66	2744.15	431.67	2755.39	432.09	2772.37	432.15
2786.33	431.93	2800.47	432.08	2805.72	432.04	2814.6	432.04	2822.49	431.93
2828.58	431.8	2854.01	431.85	2856.58	431.9	2862.19	431.74	2872.32	431.58
2884.91	431.85	2889.09	431.86	2905.87	431.77	2913.06	431.98	2922.14	432.1
2926.99	432.1	2941.16	432.23	2972.47	432.37	2989.25	432.6	3005.51	432.88
3022.29	433.06	3025.75	433.12	3039.07	433.2	3054.07	433.13	3072.62	433.16
3082.09	433.78	3088.89	433.84	3096.05	433.85	3105.67	433.82	3122.44	433.88
3134.4	433.5	3139.22	433.41	3152.19	433.84	3164.06	433.69	3176.18	433.7
3187.8	433.67	3194.94	433.59	3214.22	433.53	3223.73	433.55	3235.74	433.69
3252.8	433.55	3259.64	433.56	3295.31	433.24	3302.68	433.07	3310.07	432.96
3319.3	432.9	3331.32	432.88	3359.9	433.28	3372.48	435.42	3388.52	434.11
3397.79	433.5	3405.92	433.6	3414.87	433.6	3425.21	433.76	3426.89	434.11
3429.66	434.24	3438.85	435.24	3444.5	434.91	3450.68	435.28	3453.56	435.01
3462.66	436.45	3518.84	441.14	3521.06	441.05	3524.29	441.31	3540.35	441.31
3556.15	440.27	3569.97	440	3578.34	438.96	3581.99	438.58	3593.97	437.19
3597.63	437.48	3605.91	437.71	3616.91	434.56	3619.4	434.38	3636.2	433.48
3641.77	432.63	3654.9	431.34	3674.19	429.5	3682.65	430.61	3689.39	432.37
3693.48	432.27	3710.08	432.31	3716.71	432.42	3754.75	433.3	3770.04	433.79
3777.76	433.97	3789.33	434.1	3796.98	434.04	3808.61	434.28	3809.63	434.26
3827.9	433.17	3832.8	433.06	3846.6	433.57	3856.51	433.64	3865.89	433.79
3872.87	433.87	3885.18	433.96	3892.55	433.97	3904.46	433.91	3916.51	434.62
3923.75	434.77	3928.37	435.08	3936.12	435.01	3942.45	435.17	3952.08	436.58
3961.74	436.12	3967.99	435.69	3976.06	435.54	3981.03	436.03	3988.01	436.58
3999.37	434.71	4000.31	434.65	4016.19	434.94	4023.1	434.61	4050.23	434.58
4071.21	435.07	4076.88	434.99	4094.48	434.86	4096.16	434.88	4107.54	434.82
4115.45	434.89	4133.92	434.85	4169.91	434.84	4190.86	434.73	4211.3	434.73
4239.23	434.37	4245.79	434.77	4268.72	434.78	4277.31	434.85	4301.26	436.37
4355.41	436.19	4364.43	435.78	4379.82	435.55	4382.25	435.48	4393.01	433.84
4438.54	432.18	4457.01	431.12	4479.56	430.4	4489.65	430.4	4498.85	430.96
4501.61	431.16	4506.32	431.35	4517.55	431.92	4525.33	432.14	4536.84	432.32
4544.49	432.86	4556.13	433.91	4563.77	434.07	4575.42	433.95	4632.59	435.54
4644.75	435.37	4651.98	435.32	4668.78	435.31	4680.8	435.19	4692.77	435.12
4704.51	434.96	4728.54	434.79	4747.83	434.5	4764.33	434.19	4776.28	434.07

4786.41	434.11	4799.96	433.83	4805.11	433.63	4811.87	433.16	4824.4	432.49
4835.9	431.96	4843.68	431.55	4847.91	431.16	4854.91	430.72	4859.9	430.33
4862.97	430.23	4871.85	429.17	4882.26	426.43	4883.76	426.12	4886.29	425.9
4895.53	425.39	4900.96	424.97	4907.44	425.42	4918.15	427.21	4920.25	427.59
4931.39	428.87	4939.53	429.06	4948.91	430.4	4953.08	430.93	4981.4	432.83
5001.46	432.95	5013.27	433.07	5026.27	433.16	5044.65	434.24	5051	434.38
5073.96	435.77	5076.52	435.88	5092.66	435.97	5098.46	435.95	5107.9	436.01
5122.43	435.99	5134.45	435.91	5146.46	435.96	5158.48	435.93	5169.81	435.83
5182.21	435.53	5194.03	435.29	5207.8	435.26	5218.01	435.18	5227.08	435.14
5234.88	436.92	5256.6	442.18	5266.26	445.64	5280.4	449.23	5298.12	456.07
5304.31	457.87	5322.93	465.09	5325.59	465.39	5329.99	465.51	5337.56	465.54
5342.22	465.18	5349.51	465.14	5361.51	464.82	5373.24	463.05	5374.19	462.79
5388.84	462.77								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1458.83	.04	1642.79	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1458.83	1672.33	0	0	0	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
394	1160	438	F
1730	4632	438	F

SUMMARY OF MANNING'S N VALUES

River:Thompsons

Reach	River Sta.	n1	n2	n3	n4
Thompsons	4901	.1	.04	.1	
Thompsons	4602	.1	.04	.1	
Thompsons	4104	.1	.06	.04	.1
Thompsons	3597	.1	.04	.1	
Thompsons	3098	.1	.04	.1	
Thompsons	2597	.1	.04	.1	
Thompsons	2097	.1	.04	.1	
Thompsons	1600	.1	.04	.1	
Thompsons	1098	.1	.04	.06	
Thompsons	738	.1	.04	.06	

SUMMARY OF REACH LENGTHS

River: Thompsons

Reach	River Sta.	Left	Channel	Right
Thompsons	4901	300	299	290
Thompsons	4602	517	498	440
Thompsons	4104	650	507	490
Thompsons	3597	510	499	584
Thompsons	3098	690	501	980
Thompsons	2597	760	500	410
Thompsons	2097	460	497	900
Thompsons	1600	700	502	530
Thompsons	1098	510	360	381
Thompsons	738	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Thompsons

Reach	River Sta.	Contr.	Expan.
Thompsons	4901	.1	.3
Thompsons	4602	.1	.3
Thompsons	4104	.1	.3
Thompsons	3597	.1	.3
Thompsons	3098	.1	.3
Thompsons	2597	.1	.3
Thompsons	2097	.1	.3
Thompsons	1600	.1	.3
Thompsons	1098	.1	.3
Thompsons	738	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Thompsons	4901	100 year	2740.00	430.75	435.83		436.24	0.002652	5.12	535.08	120.52	0.43
Thompsons	4901	25 year	2170.00	430.75	435.29		435.62	0.002462	4.61	470.26	117.24	0.41
Thompsons	4901	10 year	1820.00	430.75	434.87		435.16	0.002413	4.31	421.93	114.74	0.40
Thompsons	4901	5 year	1510.00	430.75	434.44		434.70	0.002417	4.04	373.45	112.18	0.39
Thompsons	4901	2 year	1050.00	430.75	433.73		433.92	0.002441	3.56	294.57	107.87	0.38
Thompsons	4602	100 year	2680.00	430.00	435.04		435.45	0.002664	5.13	521.95	117.27	0.43
Thompsons	4602	25 year	2190.00	430.00	434.51		434.86	0.002600	4.75	460.95	114.42	0.42
Thompsons	4602	10 year	1850.00	430.00	434.11		434.42	0.002551	4.45	415.59	112.25	0.41
Thompsons	4602	5 year	1530.00	430.00	433.69		433.96	0.002511	4.14	369.43	110.00	0.40
Thompsons	4602	2 year	1060.00	430.00	432.99		433.19	0.002484	3.62	292.99	106.17	0.38
Thompsons	4104	100 year	2680.00	428.75	433.55	431.68	434.01	0.003131	5.41	495.69	883.82	0.46
Thompsons	4104	25 year	2190.00	428.75	433.12	431.32	433.49	0.002896	4.91	445.62	779.11	0.44
Thompsons	4104	10 year	1850.00	428.75	432.79	431.05	433.11	0.002697	4.53	408.69	690.92	0.42
Thompsons	4104	5 year	1530.00	428.75	432.44	430.78	432.70	0.002524	4.14	369.25	657.11	0.40
Thompsons	4104	2 year	1060.00	428.75	431.79	430.35	431.98	0.002347	3.55	298.62	346.02	0.37
Thompsons	3597	100 year	2870.00	427.50	432.78	430.84	432.92	0.001273	3.64	1801.32	1058.13	0.30
Thompsons	3597	25 year	2290.00	427.50	432.15	430.15	432.33	0.001628	3.82	1230.73	918.37	0.33
Thompsons	3597	10 year	1910.00	427.50	431.69	429.85	431.90	0.001967	3.95	865.93	785.86	0.36
Thompsons	3597	5 year	1580.00	427.50	431.25	429.58	431.48	0.002236	3.94	579.27	504.65	0.38
Thompsons	3597	2 year	1100.00	427.50	430.54	429.13	430.75	0.002503	3.67	308.82	261.34	0.39
Thompsons	3098	100 year	2870.00	426.25	431.85		432.15	0.001851	4.53	936.08	630.05	0.36
Thompsons	3098	25 year	2290.00	426.25	431.08		431.39	0.002164	4.49	563.91	266.13	0.38
Thompsons	3098	10 year	1910.00	426.25	430.55		430.84	0.002274	4.30	459.55	157.83	0.39
Thompsons	3098	5 year	1580.00	426.25	430.08		430.34	0.002335	4.06	393.83	129.77	0.39
Thompsons	3098	2 year	1100.00	426.25	429.31		429.51	0.002449	3.63	303.16	108.34	0.38
Thompsons	2597	100 year	3060.00	425.00	430.77	428.18	431.14	0.002102	4.91	674.55	351.71	0.39
Thompsons	2597	25 year	2400.00	425.00	429.94	427.72	430.28	0.002241	4.63	518.25	119.66	0.39
Thompsons	2597	10 year	1980.00	425.00	429.40	427.40	429.70	0.002279	4.36	454.19	116.40	0.39
Thompsons	2597	5 year	1630.00	425.00	428.91	427.12	429.17	0.002319	4.10	397.78	113.46	0.39
Thompsons	2597	2 year	1110.00	425.00	428.09	426.65	428.29	0.002403	3.62	306.78	108.54	0.38
Thompsons	2097	100 year	3060.00	423.75	429.82	426.93	430.16	0.001781	4.66	657.20	126.44	0.36
Thompsons	2097	25 year	2400.00	423.75	428.94	426.47	429.24	0.001893	4.38	547.97	121.14	0.36
Thompsons	2097	10 year	1980.00	423.75	428.38	426.15	428.65	0.001909	4.11	481.35	117.80	0.36
Thompsons	2097	5 year	1630.00	423.75	427.88	425.86	428.11	0.001929	3.86	422.36	114.75	0.35
Thompsons	2097	2 year	1110.00	423.75	427.01	425.39	427.19	0.002011	3.42	324.88	109.54	0.35
Thompsons	1600	100 year	3300.00	422.75	428.85	426.06	429.22	0.001976	4.93	689.60	161.79	0.38
Thompsons	1600	25 year	2510.00	422.75	427.96	425.53	428.27	0.001985	4.51	557.45	130.07	0.37
Thompsons	1600	10 year	2060.00	422.75	427.41	425.20	427.68	0.001972	4.20	490.11	119.04	0.37

Thompsons	1600	5 year	1690.00	422.75	426.89	424.91	427.13	0.001987	3.93	429.87	116.19	0.36
Thompsons	1600	2 year	1120.00	422.75	426.02	424.40	426.19	0.001985	3.39	329.91	111.30	0.35
Thompsons	1098	100 year	3300.00	421.75	427.83	425.10	428.21	0.002036	5.00	661.07	137.20	0.39
Thompsons	1098	25 year	2510.00	421.75	426.93	424.55	427.26	0.002070	4.57	548.95	121.70	0.38
Thompsons	1098	10 year	2060.00	421.75	426.39	424.22	426.67	0.002050	4.26	483.87	118.68	0.37
Thompsons	1098	5 year	1690.00	421.75	425.85	423.92	426.10	0.002114	4.01	421.24	115.71	0.37
Thompsons	1098	2 year	1120.00	421.75	424.97	423.41	425.16	0.002139	3.49	321.32	110.17	0.36
Thompsons	738	100 year	3420.00	421.03	426.99	424.45	427.40	0.002502	5.20	690.91	172.81	0.42
Thompsons	738	25 year	2620.00	421.03	426.05	423.91	426.43	0.002499	4.94	543.39	146.87	0.42
Thompsons	738	10 year	2150.00	421.03	425.52	423.57	425.85	0.002501	4.62	468.80	131.82	0.41
Thompsons	738	5 year	1730.00	421.03	424.99	423.24	425.27	0.002503	4.29	403.35	114.28	0.40
Thompsons	738	2 year	1130.00	421.03	424.12	422.70	424.33	0.002504	3.69	306.27	108.51	0.39

HEC-RAS Report for Alternative 4

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HEC-RAS Version 3.1.1 May 2003
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104
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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X      XXX   XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: Prelim. Analysis Thompson's Branch
Project File : TBrPrelim.prj
Run Date and Time: 5/9/2007 12:30:22 PM

Project in English units

PLAN DATA

Plan Title: Geo with 50'BW_XSFILL_25Yr
Plan File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.p11

Geometry Title: Extended Geometry w/ 50' BW_FILLXS_25Yr
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g13

Flow Title : Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

```
Plan Summary Information:
Number of:  Cross Sections =   10    Mulitple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance =  0.01
    Critical depth calculaton tolerance =  0.01
    Maximum number of interations       =  20
    Maximum difference tolerance        =  0.3
    Flow tolerance factor               =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

FLOW DATA

Flow Title: Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Flow Data (cfs)

River	Reach	RS	100 year	25 year	10 year	5 year	2 year
Thompsons	Thompsons	4901	2740	2170	1820	1510	1050
Thompsons	Thompsons	4602	2680	2190	1850	1530	1060
Thompsons	Thompsons	3597	2870	2290	1910	1580	1100
Thompsons	Thompsons	2597	3060	2400	1980	1630	1110
Thompsons	Thompsons	1600	3300	2510	2060	1690	1120
Thompsons	Thompsons	738	3420	2620	2150	1730	1130

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Thompsons	Thompsons	100 year		Normal S = 0.0025
Thompsons	Thompsons	25 year		Normal S = 0.0025
Thompsons	Thompsons	10 year		Normal S = 0.0025
Thompsons	Thompsons	5 year		Normal S = 0.0025
Thompsons	Thompsons	2 year		Normal S = 0.0025

GEOMETRY DATA

Geometry Title: Extended Geometry w/ 50' BW_FILLXS_25Yr
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g13

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4901

INPUT
Description:
Station Elevation Data num= 84

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	444.78	3.03	444.68	9.59	444.46	19.83	444.26	26.09	444.15
36.62	443.85	42.59	443.67	53.08	443.35	58.6	443.11	69.7	442.75
75.1	442.6	86.49	442.32	91.6	442.19	103.28	442.02	108.1	441.95
120.08	441.91	124.61	441.89	136.49	441.83	140.61	441.83	153.15	441.66
157.11	441.63	169.95	441.44	173.61	441.36	186.74	441.06	190.12	440.95
203.53	440.64	206.62	440.56	219.9	440.46	222.62	440.35	236.61	439.89
239.12	439.85	253.4	439.82	255.63	439.82	270.2	439.82	272.13	439.78
286.99	439.65	288.63	439.59	303.32	439.27	304.63	439.28	320.07	439.2
321.14	439.19	336.86	439.08	337.64	439.08	353.65	439.15	354.14	439.15
355.48	439.15	365	441.21	383.5	437.58	404	430.75	417.35	430.75
429.71	430.75	454	430.75	469.23	437.14	615.91	437.14	616.64	437.16
631.94	438.2	632.64	438.23	648.43	438.84	649.14	438.86	664.95	439.36
665.64	439.39	681.46	440.15	682.14	440.18	697.97	440.73	698.64	440.76
714	441.22	714.64	441.24	730.5	441.78	731.14	441.8	747.01	442.15
747.64	442.18	763.52	442.79	764.14	442.82	780.03	443.48	780.64	443.5
796.06	444.64	796.64	444.66	812.56	446.19	813.14	446.23	829.07	446.25
829.64	446.26	845.58	446.52	846.14	446.54	849.41	446.64		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	383.5	.04	469.23	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
383.5	469.23	300	299	290	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4602

INPUT
Description:
Station Elevation Data num= 82

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	440.68	3.59	440.73	6.09	440.71	19.59	440.54	22.14	440.49
36.09	439.95	38.61	439.9	52.59	439.67	55.08	439.6	80	439.24
95.41	436.2	114	430	130.19	430	148.87	430	164	430
176.2	436.38	365.34	436.38	375.76	436.79	378.16	436.87	384.6	437.22
390.96	437.55	393.37	437.7	403.74	438.03	410.98	438.38	416.51	438.72
428.59	439.21	429.27	439.23	431.12	439.32	441.8	439.82	445.67	439.98
454.54	440.38	463.28	440.7	467.37	440.84	478.35	441.1	480.2	441.14
480.89	441.16	493.02	441.54	498.5	441.61	505.85	441.8	516.11	442.07
518.62	442.17	525.58	442.45	531.14	442.67	533.18	442.76	543.87	443.07
550.79	443.4	556.64	443.52	568.4	443.96	569.41	443.99	572.09	444.09
582.23	444.39	586.01	444.46	595.06	444.33	603.62	444.34	607.79	444.36
619.32	444.49	620.33	444.5	620.7	444.5	633.09	444.76	638.31	444.86
645.87	445.17	655.91	445.47	658.64	445.49	665.84	445.6	671.44	445.67
673.52	445.69	684.26	445.77	691.13	445.9	696.96	445.89	708.21	446.01
709.53	446.03	713.07	446.06	722.36	446.11	725.82	446.13	735.18	446.25
743.43	446.36	748.01	446.38	760.3	446.68	760.84	446.69	761.04	446.7
773.61	446.85	776.69	446.87						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	95.41	.04	176.2	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
95.41	176.2	517	498	440	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4104

INPUT
Description:
Station Elevation Data num= 240

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.12	6.1	435.47	11.47	434.9	22.73	433.25	27.97	432.44
39.37	431.58	44.47	431.22	55.65	431.57	60.47	431.69	72.13	431.84
76.98	431.93	88.77	431.49	93.48	431.32	105.4	430.85	109.98	430.64
122.04	430.44	126.48	430.41	138.3	430.82	142.48	430.94	154.81	431.24
158.98	431.34	171.44	431.49	175.48	431.61	200.88	431.42	208.48	431.23
220.95	431.04	224.48	431.03	237.48	431.05	240.98	431.05	254.11	431.21
257.48	431.27	270.75	431.72	273.98	431.74	287.38	432.73	290.48	432.82
303.6	431.55	306.48	431.45	320.15	432.1	322.98	432.18	336.78	432.15
339.48	432.18	353.42	431.89	355.98	431.88	370.05	431.79	372.48	431.78
386.25	431.95	388.48	431.95	402.82	432.01	404.99	432.02	419.45	432.09
421.49	432.12	436.09	432.1	437.99	432.07	452.72	432.19	454.49	432.21
468.9	432.22	470.49	432.24	485.49	432.2	486.99	432.19	502.12	431.97
503.49	431.96	518.76	431.97	519.99	431.96	535.39	431.94	536.49	431.94
551.55	431.93	552.49	431.93	568.16	432.07	568.99	432.08	584.79	432.42
585.49	432.43	601.43	432.73	601.99	432.75	618.06	432.93	618.49	432.94
634.2	433.16	634.49	433.17	650.83	433.59	650.99	433.59	667.46	434.16
667.49	434.16	671.36	434.2	683.99	434.31	684.1	434.31	700.49	434.37
700.72	434.37	716.5	434.17	716.86	434.16	733	434.09	733.49	434.09
749.5	434.03	750.12	434.04	766	434.14	766.76	434.13	782.5	433.84
783.36	433.83	798.5	433.75	799.52	433.75	815	433.8	816.15	433.81
831.5	433.96	832.78	433.94	848	433.99	856.81	433.95	946.5	433.14
948.64	433.11	962.5	432.99	964.84	432.99	979	433.02	981.47	433.01
995.5	433	998.1	433.03	1005.03	433.11	1052.01	433.71	1057.95	433.79
1061.01	433.86	1064.13	433.84	1077.51	433.8	1080.76	433.77	1094.01	433.77
1107.04	436.09	1113.92	436.88	1126.51	437.36	1130.16	437.55	1143.01	438.42
1146.79	438.58	1159.51	439.34	1163.42	439.31	1176.01	439.06	1180.06	439.09
1192.51	439.05	1196.56	439.19	1208.51	439.67	1212.82	439.85	1225.01	440.01
1229.45	440.13	1241.51	440.09	1253.38	439.93	1258.01	439.68	1272.1	439.69
1279.2	439.64	1290.51	439.66	1295.48	439.51	1307.01	439.11	1313	438.94
1334.2	435.02	1353	428.75	1403	428.75	1408	429.52	1419	436.07
1738.1	436.07	1738.47	436.07	1739.05	436.07	1750.43	436.18	1757.6	436.23
1762.31	436.25	1770.02	436.29	1774.02	436.31	1776.51	436.33	1785.87	436.34
1796.01	436.28	1797.77	436.3	1800.52	436.31	1809.71	436.39	1815.51	436.42
1821.68	436.52	1831.48	436.73	1833.64	436.78	1835	436.8	1845.61	436.96
1854.5	437.08	1857.52	437.13	1862.45	437.2	1869.22	437.28	1873.41	437.37
1881.03	437.5	1892.91	437.6	1892.92	437.6	1892.95	437.6	1904.89	437.81
1912.41	437.9	1916.85	437.95	1923.92	438.04	1928.79	438.1	1931.9	438.17
1940.68	438.35	1951.4	438.4	1952.56	438.42	1954.42	438.44	1964.28	438.57
1970.31	438.61	1976.13	438.66	1985.38	438.75	1988.1	438.78	1989.81	438.81
2000.06	438.94	2009.31	439.06	2012.03	439.09	2016.35	439.11	2023.95	439.16
2028.8	439.21	2035.84	439.34	2046.85	439.53	2047.74	439.54	2048.3	439.55
2059.49	439.81	2067.21	439.95	2071.31	439.98	2077.82	440.09	2083.24	440.19
2086.71	440.25	2095.13	440.39	2106.21	440.59	2107.03	440.61	2108.32	440.67
2118.99	441.06	2125.7	441.4	2130.95	441.5	2139.28	441.65	2142.92	441.72
2145.2	441.76	2154.7	441.89	2164.11	442.07	2166.48	442.13	2170.25	442.26
2178.4	442.54	2183.61	442.79	2190.29	443.04	2200.75	443.27	2202.19	443.31
2203.1	443.38	2214.16	444.45	2222.6	445.58	2226.12	445.89	2231.72	446.62
2238.05	447.2	2242.1	447.27	2249.8	447.34	2261.01	447.46	2261.42	447.47

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1334.2	.04	1419	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1313	1419	650	507	490	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	1229.45	440.13	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3597

INPUT
Description:
Station Elevation Data num= 350

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.05	6.13	435.53	12.12	435.04	22.3	432.82	28.63	431.64
38.46	430.65	45.13	429.97	54.63	430.56	61.63	430.86	70.52	431.18
77.64	431.32	86.46	431.25	94.14	431.17	102.63	431.06	110.64	430.97
118.79	431.07	127.15	431.14	134.96	431.24	143.65	431.34	150.9	431.36
159.66	431.37	166.8	431.34	176.16	431.43	182.96	431.43	192.66	431.47
199.13	431.76	209.17	432.03	215.29	432.18	225.67	432.49	231.28	432.62
241.67	432.65	247.13	432.52	258.18	432.53	263.29	432.5	274.68	432.27
279.46	432.21	291.18	432.11	295.62	432.11	307.69	432.07	311.67	432.01
323.69	431.79	327.46	431.74	340.19	431.55	343.63	431.52	356.7	431.34
359.79	431.34	373.2	431.28	375.96	431.27	389.7	431.4	392.05	431.39
405.71	431.35	407.79	431.34	422.21	431.27	423.96	431.24	438.71	431.08
440.12	431.08	455.22	430.89	456.29	430.89	471.72	430.67	472.43	430.67
487.73	430.67	488.13	430.67	504.23	430.52	504.29	430.52	507.26	430.52
520.46	430.51	520.73	430.51	536.63	430.5	537.24	430.5	552.8	430.54
553.74	430.53	568.52	430.43	569.74	430.43	584.65	430.51	586.25	430.52
600.82	430.48	602.75	430.48	616.99	430.53	619.25	430.53	633.16	430.51
635.76	430.51	648.92	430.58	651.76	430.57	665	430.65	668.26	430.66
681.17	430.76	684.77	430.8	697.34	430.91	701.27	430.96	713.51	431.1

717.77	431.17	729.33	431.29	733.78	431.35	745.36	431.41	750.28	431.42
761.53	431.45	766.78	431.46	777.7	431.58	783.29	431.6	793.87	431.7
799.79	431.79	809.73	431.92	815.8	431.96	825.72	432.1	832.3	432.23
841.89	432.37	848.8	432.46	858.06	432.58	865.31	432.68	874.23	432.88
881.81	433.07	890.14	433.34	897.81	433.42	906.08	433.45	914.32	433.5
922.25	433.47	930.82	433.52	1397.73	433.52	1413	427.5	1463	427.5
1483.61	434.37	1502.16	433.84	1503.02	433.83	1504.92	433.79	1519.28	433.9
1521.42	433.92	1535.54	434.54	1537.92	434.63	1551.38	434.57	1553.93	434.56
1567.56	434.18	1570.43	434.09	1583.82	434.09	1586.93	434.1	1600.07	434.36
1603.43	434.44	1616.33	434.54	1619.93	434.57	1632.21	434.35	1635.94	434.33
1648.35	434.39	1651.86	434.41	1652.55	434.42	1661.2	434.64	1672.3	434.73
1673.12	434.72	1674.35	434.72	1684.96	434.67	1692.05	434.66	1696.8	434.57
1703.92	434.42	1708.67	434.31	1711.8	434.25	1720.42	434.25	1730.96	434.29
1732.14	434.31	1733.93	434.32	1743.99	434.39	1750.71	434.53	1755.83	434.63
1763.5	434.73	1767.7	434.8	1770.46	434.85	1779.61	434.84	1790.21	434.78
1791.52	434.77	1793.51	434.76	1803.44	434.71	1809.96	434.67	1815.25	434.76
1823.53	434.87	1826.92	434.92	1829.12	434.93	1838.72	435.02	1848.87	435.12
1850.56	435.1	1853.09	435.07	1862.46	434.95	1868.62	434.9	1874.37	434.83
1883.11	434.71	1886.26	434.67	1888.37	434.65	1898.11	434.61	1908.12	434.55
1909.91	434.55	1912.68	434.57	1921.59	434.61	1927.28	434.65	1933.39	434.72
1942.69	434.81	1945.31	434.83	1947.03	434.85	1957.22	434.88	1966.78	434.9
1969.13	434.91	1972.71	434.9	1981	434.89	1986.53	434.89	1992.84	434.88
2002.27	434.87	2004.69	434.86	2006.28	434.86	2016.41	434.89	2025.44	434.86
2028.16	434.85	2032.29	434.83	2040.02	434.78	2045.19	434.75	2051.86	434.71
2061.85	434.68	2063.71	434.68	2064.94	434.67	2075.63	434.65	2084.69	434.62
2087.54	434.62	2091.87	434.6	2099.45	434.58	2104.44	434.53	2111.24	434.54
2121.89	434.52	2122.92	434.52	2123.59	434.51	2134.75	434.5	2143.35	434.43
2146.59	434.42	2151.45	434.47	2158.48	434.55	2163.1	434.55	2170.39	434.55
2181.47	434.64	2182.3	434.65	2182.85	434.65	2194.14	435.03	2202.6	434.89
2205.91	434.74	2211.03	434.85	2217.58	434.83	2221.75	434.88	2229.41	434.66
2241.05	434.54	2241.32	434.53	2241.5	434.52	2253.24	433.77	2261.26	432.99
2265.15	432.78	2271.07	432.43	2277.03	432.11	2281.01	431.99	2288.87	431.79
2300.63	431.53	2300.71	431.53	2300.76	431.53	2312.4	431.59	2319.91	431.32
2324.17	431.36	2330.65	431.32	2336.05	431.71	2339.66	431.85	2347.89	432.05
2359.42	432.97	2359.73	432.99	2360.21	433.02	2371.64	433.41	2379.17	433.94
2383.56	434.05	2390.23	434.18	2395.47	434.01	2398.92	434.12	2407.23	434.33
2418.07	434.78	2418.93	434.83	2420.25	434.88	2430.78	434.97	2437.82	435.14
2442.62	435.22	2449.81	435.43	2454.49	435.52	2457.57	435.63	2466.41	435.74
2477.33	435.98	2478.32	435.95	2479.83	435.9	2490.17	435.42	2497.08	435.28
2501.92	435.27	2509.39	435.21	2513.57	435.16	2516.23	435.14	2525.43	435.16
2535.98	435.19	2537.34	435.18	2539.41	435.18	2549.26	435.19	2555.73	435.17
2561.17	435.19	2569.43	435.15	2573.06	435.15	2575.49	435.15	2584.9	435.37
2595.24	435.58	2596.71	435.6	2598.99	435.66	2608.39	435.93	2614.39	435.97
2620.19	435.98	2629.01	436.09	2632.09	436.13	2634.14	436.16	2643.93	436.19
2653.89	436.19	2655.77	436.2	2658.57	436.21	2667.66	436.21	2673.65	436.27
2679.57	436.36	2688.59	436.46	2691.49	436.49	2693.4	436.54	2703.21	436.89
2712.55	437.03	2714.95	437.11	2718.6	437.24	2726.81	437.6	2732.3	437.71
2738.66	437.86	2748.17	438.29	2750.51	438.4	2752.05	438.44	2762.42	438.55
2771.8	438.75	2774.34	438.78	2778.18	438.84	2786.2	438.89	2791.56	438.95
2797.92	439.02	2807.75	439.11	2809.56	439.14	2810.71	439.17	2821.45	439.34
2830.46	439.6	2833.36	439.69	2837.77	439.74	2845.27	439.85	2850.21	439.93
2857.19	440.1	2867.78	440.27	2869.09	440.3	2869.96	440.32	2875.28	440.48

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1397.73	.04	1483.61	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1397.73	1483.61	510	499	584	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
1770	2438	436	F
0	930.82	433.52	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3098

INPUT
Description:
Station Elevation Data num= 426

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.2	1.24	436.13	14.84	434.22	17.24	433.89	31.14	431.7
33.74	431.33	47.51	429.83	50.24	429.45	63.89	430.18	66.74	430.35
80.26	430.92	83.24	431.05	96.23	431.18	99.24	431.22	112.51	430.73
115.74	430.64	128.88	430.51	132.24	430.46	145.26	430.79	148.74	430.87
165.24	431.1	177.62	431.14	181.24	431.14	193.88	431.19	197.74	431.2
210.25	431.27	226.63	431.39	230.74	431.43	243	431.49	247.24	431.56
259.01	431.53	263.24	431.51	275.25	431.39	279.74	431.31	291.62	431.34
308	431.42	312.74	431.43	324.37	431.36	329.24	431.34	345.25	431.24
372.99	430.99	378.25	430.92	394.75	431.01	405.74	431.14	411.25	431.23
421.79	431.33	427.25	431.35	437.99	431.34	443.75	431.37	454.36	431.51
460.25	431.56	487.11	431.54	493.25	431.52	503.17	431.64	509.25	431.74
525.75	431.76	542.25	431.89	552.11	431.88	558.75	431.91	568.48	431.99
575.25	432.07	584.56	432.12	591.25	432.17	607.75	432.02	617.1	432.05
624.25	432.03	640.75	432.15	657.25	432.14	665.95	432.11	673.26	432.11

682.1	432.09	689.76	432.05	698.47	432.17	706.26	432.31	714.85	432.39
722.76	432.41	739.26	432.4	755.26	432.36	771.76	432.49	779.84	432.5
788.26	432.49	796.22	432.56	804.76	432.57	812.59	432.65	821.26	432.83
837.26	432.7	844.84	432.66	853.76	432.54	861.21	432.48	870.26	432.53
886.76	432.45	893.96	432.45	903.26	432.4	910.12	432.46	919.26	432.52
926.21	432.55	942.58	432.52	952.26	432.54	958.96	432.53	975.33	432.44
985.26	432.43	991.51	432.46	1001.27	432.47	1007.58	432.52	1017.77	432.56
1023.95	432.56	1040.33	432.63	1050.77	432.76	1056.66	432.94	1059.61	433.39
1072.96	434.33	1080.36	434.32	1102.72	435.18	1109.42	435.54	1137.67	435.54
1143.71	435.47	1238.36	434.69	1261.77	434.41	1334.36	433.31	1336.06	433.21
1339.39	433.02	1345.78	433.39	1355	433	1383.82	431.98	1395.9	427.95
1401.24	426.24	1405.69	426.25	1451	426.25	1473.14	433.63	1477.28	433.77
1481.4	433.77	1491.62	433.83	1493.44	433.85	1496.12	433.83	1508.59	433.63
1521.06	433.5	1529.67	433.53	1533.52	433.64	1545.97	433.82	1547.79	433.85
1565.9	434.01	1581.38	433.82	1582.83	433.8	1583.47	433.79	1595.28	433.72
1601.59	433.67	1607.75	433.78	1619.7	433.95	1620.21	433.95	1637.82	434.12
1645.03	434.1	1655.93	434.11	1660.71	434.08	1669.6	434.01	1673.5	433.97
1691.62	434.33	1706.91	434.28	1709.73	434.3	1727.85	433.99	1731.84	434.01
1740.64	433.89	1744.29	433.88	1745.96	433.86	1756.47	434.13	1763.53	434.13
1768.72	434.23	1780.01	434.69	1781.14	434.73	1781.65	434.74	1793.6	434.85
1799.76	434.98	1806.07	434.94	1830.95	434.91	1835.99	434.93	1843.2	434.93
1853.56	434.97	1855.38	434.97	1859.34	434.95	1867.83	434.88	1871.68	434.88
1892.76	434.8	1899.31	434.84	1905.22	434.86	1907.91	434.86	1917.69	434.91
1926.02	435.01	1930.07	435.03	1939.27	435.05	1954.64	435.06	1961.71	435.04
1967.04	435.07	1979.82	435.07	1991.92	435.03	1997.94	435.06	2004.38	435.06
2016.05	434.89	2016.83	434.89	2018.6	434.9	2033.62	435.02	2041.29	434.96
2051.74	434.84	2066.15	434.7	2078.61	434.5	2087.97	434.32	2091.08	434.28
2097.94	434.25	2103.54	434.21	2106.08	434.21	2115.8	434.27	2123.65	434.28
2128.1	434.35	2140.55	434.49	2141.77	434.51	2152.96	434.65	2159.88	434.68
2177.27	434.84	2177.77	434.85	2178	434.85	2196.11	435.05	2202.56	435.09
2213.68	435.13	2227.21	435.12	2231.8	434.94	2239.61	434.9	2249.91	435.05
2252.02	435.04	2264.46	435.59	2268.03	435.65	2286.14	435.6	2289.33	435.56
2296.56	435.52	2301.53	435.46	2303.71	435.46	2313.95	435.42	2321.83	435.49
2326.41	435.5	2338.87	435.33	2339.94	435.33	2351.27	435.4	2358.06	435.37
2363.68	435.44	2375.9	435.51	2376.17	435.51	2388.29	435.55	2393.74	435.58
2411.86	435.44	2413.11	435.41	2415.86	435.37	2429.97	435.11	2437.93	435.05
2448.09	435.15	2450.34	435.16	2455.23	435.17	2466.2	435.21	2487.33	435.38
2512.26	435.47	2520	435.44	2524.73	435.43	2535.16	435.35	2537.19	435.34
2538.12	435.34	2549.59	435.5	2556.23	435.62	2573.8	435.73	2574.03	435.73
2574.52	435.72	2586.49	435.61	2591.92	435.58	2598.96	435.6	2614.49	435.6
2623.84	435.58	2628.15	435.62	2636.25	435.81	2646.26	435.91	2648.61	435.9
2653.85	435.96	2660.78	436.02	2663.83	436.06	2673.18	436.04	2681.95	435.98
2685.65	435.97	2698.12	435.9	2700.06	435.88	2710.58	435.85	2718.18	435.85
2723.05	435.81	2733.79	435.76	2735.5	435.75	2736.29	435.74	2747.67	435.54
2753.86	435.48	2759.94	435.38	2771.98	435.29	2773.15	435.29	2784.81	435.18
2797.27	435.04	2808.21	434.89	2809.74	434.88	2813.12	434.89	2826.32	434.9
2834.4	434.93	2843.89	434.94	2846.6	434.93	2852.48	434.96	2859.04	434.98
2862.01	434.97	2871.5	434.96	2880.12	434.98	2892.45	435.04	2896.43	435.05
2898.24	435.07	2916.35	434.77	2921.26	434.68	2932.42	434.52	2933.46	434.51
2933.92	434.5	2952.04	434.55	2958.26	434.65	2970.15	434.77	2970.67	434.78
2971.78	434.79	2983.13	434.92	2988.27	434.96	3006.38	435.2	3008.02	435.23
3020.19	435.49	3023.95	435.6	3032.51	435.77	3042.07	436	3057.35	436.25
3060.18	436.29	3069.82	436.4	3078.3	436.52	3082.28	436.55	3094.75	436.71
3096.41	436.72	3106.99	436.82	3113.98	436.87	3119.3	436.95	3131.05	437.16
3131.77	437.17	3132.1	437.17	3144.17	437.48	3156.58	437.82	3168.98	438.19
3170.41	438.23	3181.44	438.58	3186.44	438.69	3204.01	438.93	3206	438.94
3218.42	439.05	3222.13	439.04	3230.83	438.94	3240.24	438.92	3243.24	438.88
3255.67	438.66	3258.36	438.62	3268.14	438.74	3276.47	438.63	3280.52	438.6
3292.72	438.53	3294.04	438.5	3305.16	438.37	3317.62	438.27	3329.68	438.43
3330.09	438.44	3330.27	438.44	3342.49	438.29	3348.39	438.29	3354.9	438.2
3366.5	438.23	3367.29	438.22	3369.04	438.21	3379.48	438.13	3384.07	438.13
3391.85	438.2	3402.19	438.16	3404.31	438.16	3409.01	438.05	3416.74	437.93
3420.3	437.54	3429.15	436.75	3438.42	436.43	3441.55	436.19	3448.37	436.12
3453.99	436.01	3456.53	435.89	3466.25	435.51	3474.1	435.3	3478.54	435.31
3488.34	435.44	3491.01	435.47	3492.22	435.49	3503.47	435.78	3510.33	435.97
3528.31	436.64	3528.45	436.65	3546.56	437.43	3553.08	437.7	3564.13	438.28
3565.25	438.32	3577.7	438.98	3582.25	439.5	3590.17	440.53	3600.36	442.08
3602.63	442.5	3607.64	443.56	3615.06	445.11	3618.48	446.45	3627.47	450.49
3636.59	453.78	3639.81	454.45	3647	456.64	3651.97	458.03	3654.16	458.45
3664.39	460.21	3672.28	461.27	3676.86	462	3686.97	464.12	3689.32	464.59
3689.76	464.7	3694.09	466.39	3696.83	466.8	3697.34	466.76	3697.71	466.72
3698.35	466.71								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1383.82	.04	1473.14	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1383.82	1473.14	690	501	980	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2597

INPUT
Description:

Station Elevation Data num= 465

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.14	14.23	434.39	20.54	433.81	40.1	432.6	41.54	432.48
46.53	432.01	62.22	430.48	66.77	430.13	83.22	430.09	93.45	430.04
103.9	430.21	120.12	430.24	124.9	430.22	145.9	430.39	146.8	430.4
166.58	430.56	172.66	430.62	187.58	430.95	191.94	431.07	196.52	431.22
200.27	431.29	213.03	431.64	217.35	431.7	229.54	431.98	234.43	432.1
246.05	432.16	251.33	432.15	262.05	432.25	268.06	432.32	278.56	432.34
295.07	432.13	302.22	432.09	311.58	432.22	319.29	432.26	328.09	432.17
336.11	432.21	352.93	432.19	360.61	432.2	377.12	432.35	404.16	432.44
410.13	432.41	420.89	432.54	426.14	432.53	437.8	432.46	442.65	432.49
454.88	432.4	471.95	432.36	475.67	432.38	489.03	432.4	492.18	432.4
505.67	432.54	508.19	432.55	522.67	432.59	524.69	432.6	539.74	432.79
541.2	432.8	556.82	433.16	557.71	433.17	573.9	433.06	574.22	433.06
590.23	433.21	590.45	433.21	606.74	433.52	607.52	433.52	623.25	433.44
624.59	433.45	639.76	433.3	641.66	433.32	656.27	433.55	658.65	433.55
672.27	433.68	675.28	433.65	688.78	433.38	709.41	433.26	721.8	433.37
726.48	433.36	743.39	433.22	754.32	433.11	760.1	433.13	770.83	433.15
777.17	433.14	787.34	433.18	794.24	433.18	803.84	433.26	811.3	433.23
836.36	433.07	844.92	432.99	852.87	432.94	869.38	432.77	879.06	432.77
885.89	432.74	896.13	432.79	902.4	432.7	912.86	432.85	918.41	433.03
929.75	432.99	934.91	432.98	946.81	432.93	951.42	432.96	963.88	432.89
980.95	432.72	984.44	432.7	997.59	432.65	1000.45	432.65	1014.57	432.73
1016.96	432.72	1031.64	432.6	1048.71	432.5	1049.98	432.49	1065.77	432.58
1066.49	432.58	1082.33	432.7	1082.49	432.71	1099	432.64	1099.39	432.64
1115.51	432.46	1116.46	432.47	1132.02	432.76	1133.53	432.77	1148.53	432.85
1150.53	432.85	1164.54	432.87	1167.15	432.91	1181.05	433.01	1184.22	433.05
1197.56	433.42	1230.57	433.74	1246.58	433.93	1251.97	433.97	1263.09	434.1
1269.04	434.21	1279.6	434.32	1286.11	434.2	1296.11	434.13	1303.18	433.99
1312.62	433.9	1328.63	433.95	1345.14	434.16	1353.86	434.38	1370.93	434.51
1378.15	434.58	1388	434.48	1394.66	434.39	1404.74	434.4	1410.67	434.47
1421.62	433.65	1434	433.09	1438.49	432.17	1460	425	1510	425
1532.37	432.46	1533	432.48	1542.23	432.61	1557.18	432.77	1558.74	432.79
1573.54	432.65	1574.74	432.64	1590.23	432.57	1591.24	432.56	1606.95	432.63
1607.74	432.63	1623.67	432.72	1624.24	432.72	1640.39	432.83	1640.74	432.83
1656.62	432.85	1673.25	432.83	1673.34	432.83	1689.75	432.9	1690.06	432.9
1706.25	432.95	1706.79	432.95	1722.75	432.82	1723.49	432.82	1738.75	432.8
1739.73	432.79	1755.25	432.7	1756.46	432.7	1771.76	432.6	1773.19	432.57
1788.26	432.49	1795.72	432.49	1800.41	432.5	1804.02	432.5	1805.42	432.51
1816.51	432.57	1829.11	432.67	1841.85	432.74	1845.82	432.77	1854.59	432.86
1858.02	432.86	1875.73	432.94	1880.08	432.99	1891.22	433.1	1892.81	433.12
1893.44	433.12	1905.23	433.26	1910.61	433.3	1917.8	433.33	1928.32	433.31
1930.48	433.3	1943.2	433.3	1955.94	433.44	1963.75	433.46	1981.34	433.3
1981.46	433.3	1993.83	433.24	2016.34	433.36	2019.1	433.36	2026.05	433.57
2031.81	433.68	2034.05	433.74	2044.55	433.95	2051.76	434.13	2057.29	434.18
2069.48	434.31	2070.02	434.29	2071.46	434.24	2082.48	433.77	2086.65	433.63
2095.13	433.46	2104.36	433.07	2107.87	432.98	2120.59	432.97	2122.07	432.96
2123.93	432.9	2125.4	432.88	2168.32	431.7	2181.53	431.68	2197.44	431.53
2246.91	431.46	2297.1	431.03	2297.82	431.01	2298.11	431.01	2310.56	431.12
2315.82	431.18	2323.31	431.12	2333.53	431.18	2335.99	431.16	2342.5	431.21
2348.43	431.22	2350.7	431.21	2361.06	431.14	2373.75	431.15	2386.12	431.12
2387.22	431.12	2399.17	431.08	2403.84	431.01	2411.91	430.99	2421.55	431.1
2424.59	431.11	2432.62	431.25	2437.03	431.32	2438.72	431.3	2449.68	431.71
2456.43	431.73	2462.26	431.67	2487.78	430.84	2491.85	430.94	2500.52	431.03
2509.56	430.99	2513.18	430.95	2522.74	430.8	2525.64	430.76	2526.74	430.75
2538.36	430.5	2544.45	430.45	2562.16	430.4	2563.84	430.4	2568.14	430.42
2576.54	430.43	2589.23	430.58	2601.82	430.63	2614.76	430.62	2626.96	430.68
2632.47	430.77	2639.71	430.84	2650.18	430.92	2652.45	430.95	2658.26	431.07
2665.16	431.18	2667.89	431.21	2677.84	431.27	2685.6	431.34	2690.42	431.37
2702.77	431.56	2702.98	431.56	2728.31	431.68	2748.38	431.62	2755.91	431.62
2773.62	431.65	2779.15	431.67	2790.79	431.68	2791.63	431.69	2793.78	431.7
2808.5	431.82	2817.01	431.87	2826.21	431.88	2829.7	431.89	2842.4	431.86
2843.92	431.87	2861.64	431.93	2867.75	431.99	2880.24	432.25	2892.94	432.4
2896.52	432.45	2918.31	432.49	2928.62	432.56	2931.01	432.58	2931.94	432.59
2943.75	432.67	2966.83	432.75	2968.85	432.79	2974.02	432.84	2981.59	432.95
2984.54	432.95	2994.33	432.97	3002.25	432.96	3007.07	432.99	3019.43	432.94
3019.96	432.94	3032.5	432.91	3037.67	432.91	3045.02	432.69	3054.85	432.45
3057.48	432.39	3064.14	432.19	3070.2	432.03	3078.01	431.98	3096.66	432.03
3106.98	432.18	3107.98	432.19	3121.11	432.19	3125.69	432.07	3133.62	431.92
3142.86	431.98	3146.1	432.06	3154.26	431.96	3158.8	431.92	3160.57	431.93
3171.54	431.96	3178.29	432.09	3184.28	431.96	3196	431.8	3199.66	431.69
3209.77	431.41	3213.71	431.33	3222.31	431.27	3230.88	430.99	3234.86	431.02
3245.07	431	3247.59	431.02	3248.59	431	3260.28	431.35	3266.3	431.33
3272.96	431.35	3284.01	431.64	3285.65	431.68	3289.78	431.81	3298.37	432.02
3301.72	432.12	3310.91	432.12	3318.9	432.24	3323.47	432.22	3335.19	432.31
3336.21	432.32	3337.54	432.32	3372.03	432.35	3374.26	432.34	3379.9	432.3
3386.98	432.23	3389.74	432.22	3399.5	432.15	3406.92	432.12	3412.08	432.08
3424.63	431.93	3424.82	431.93	3425.3	431.92	3442.34	431.81	3450.3	431.78
3460.05	431.77	3463.04	431.76	3488.21	432.14	3494.93	432.25	3500.75	432.27
3512.64	432.24	3513.43	432.24	3515.42	432.27	3526.16	432.39	3530.35	432.46
3538.91	432.64	3548.07	432.73	3556.99	432.78	3560.83	432.81	3638.52	433.16
3640.25	433.16	3650.94	433.18	3652.99	433.19	3665.47	433.19	3670.97	433.22
3688.68	433.2	3690.83	433.21	3703.54	433.38	3706.39	433.43	3716.23	433.67
3724.1	433.79	3741.06	434.01	3741.81	434.01	3758.99	434.14	3766.7	434.17
3776.7	434.3	3786.47	434.48	3792.16	434.56	3794.41	434.57	3804.84	434.72
3812.12	434.67	3817.53	434.57	3830.21	434.56	3831.18	434.57	3842.66	434.63
3855.31	434.71	3864.71	434.74	3868.05	434.71	3876.59	434.41	3880.79	434.29
3882.43	434.19	3893.53	433.42	3900.14	432.95	3906.27	432.72	3917.85	432.66

3918.98	432.71	3921.99	432.99	3931.41	433.94	3935.02	434.24	3944.01	434.97
3952.73	435.27	3956.7	435.38	3966.71	436.05	3969.39	436.2	3970.44	436.29
3982.14	436.81	3988.15	437.36	3994.88	438.09	4005.87	439.54	4007.58	439.88
4012.11	440.56	4020.01	441.91	4023.04	442.56	4032.62	444.75	4040.75	446.25
4045.31	446.94	4056.82	448.58	4058	448.75	4058.46	448.81	4076.17	453.01
4093.88	455.59	4096.17	456	4111.06	458.83	4121.32	460.43	4128.77	461.29
4134.06	462.15	4146.48	463.12	4146.8	463.16	4147.63	463.04	4154.29	461.97

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1434	.04	1532.37	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1434	1532.37	760	500	410	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2069	3842	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2097

INPUT
Description:
Station Elevation Data num= 441

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.08	8.65	435.23	17.96	434.13	25.15	432.93	34.18	431.92
41.65	430.74	50.14	430.13	57.66	429.98	66.13	430.05	74.16	430.38
82.36	430.39	90.66	430.57	123.67	430.48	130.81	430.64	139.67	431.04
146.76	431.27	156.17	431.65	162.98	431.74	172.67	431.83	179.2	432.02
189.18	432.13	195.43	432.42	205.68	432.92	211.47	433.17	221.68	433.58
238.18	433.96	243.6	434.03	254.68	434.11	266.15	434.14	276.05	434.37
287.69	434.39	292.14	434.24	303.69	434.21	308.01	434.18	320.19	434.23
324.23	434.21	336.7	434.17	340.45	434.18	353.2	434.24	356.68	434.24
372.8	434.13	385.7	434.12	388.63	434.1	402.21	434.06	421.08	434.19
437.3	434.29	451.71	434.4	453.47	434.4	484.22	434.59	517.92	434.59
533.72	434.65	549.73	434.67	599.23	434.65	630.56	434.71	648.24	434.71
664.74	434.93	679.2	435.01	681.25	435.03	695.43	434.85	697.75	434.83
713.75	434.55	727.39	434.58	730.25	434.57	746.76	434.62	763.26	434.55
776.08	434.43	779.76	434.41	791.93	434.37	795.76	434.35	812.26	434.34
824.27	434.48	828.77	434.54	840.49	434.6	845.27	434.64	861.77	434.69
872.62	434.68	877.77	434.65	888.68	434.67	921.14	434.62	927.28	434.63
937.37	434.58	953.3	434.32	959.79	434.26	969.33	434.23	976.29	434.19
985.56	434.17	992.79	434.13	1009.29	433.83	1018.01	433.69	1033.99	433.51
1041.8	433.52	1049.97	433.5	1074.8	433.18	1082.43	433.2	1091.3	433.18
1107.81	433.26	1114.67	433.27	1123.81	433.23	1130.62	433.24	1140.31	433.17
1146.85	433.14	1156.81	433.02	1163.07	432.99	1173.32	433.06	1179.3	433.13
1189.82	433.29	1195.36	433.36	1205.82	433.52	1211.26	433.57	1222.32	433.69
1227.49	433.76	1238.83	433.94	1243.72	433.97	1255.33	434.09	1259.95	434.09
1276.04	434.05	1287.83	434.08	1291.91	434.14	1304.34	434.28	1320.84	434.37
1324.36	434.36	1337.34	434.22	1340.59	434.15	1353.84	433.72	1369.84	433.17
1372.55	433.11	1386.35	432.92	1405.01	432.82	1419.35	432.78	1421.23	432.73
1437.41	432.24	1451.86	431.85	1453.2	431.83	1456	430.99	1478.79	430.82
1500	423.75	1500.08	423.75	1550	423.75	1574.63	431.96	1577.51	432.04
1578.18	432.09	1602.8	432.42	1614.27	432.5	1617.74	432.51	1631.67	432.5
1640.07	432.41	1652.64	432.45	1665.24	432.41	1678.22	432.41	1684.85	432.37
1691.2	432.36	1702.25	432.42	1704.14	432.42	1719.13	432.6	1729.83	432.71
1736.53	432.64	1742.86	432.52	1753.94	432.33	1755.89	432.31	1761.69	432.33
1768.92	432.34	1771.34	432.33	1781.95	432.23	1788.75	432.23	1794.84	432.26
1805.63	432.27	1823.03	432.1	1833.6	432.04	1840.44	431.96	1846.58	431.92
1857.84	431.96	1864.6	432.05	1875.25	432.24	1885.36	432.29	1892.12	432.24
1898.24	432.25	1909.53	432.32	1911.27	432.41	1916.45	432.49	1926.93	432.71
1937.25	433.05	1944.34	433.1	1950.23	432.9	1961.74	432.76	1967.51	432.65
1975.89	432.47	1978.62	432.46	1988.86	432.46	1996.03	432.4	2001.89	432.4
2013.43	432.38	2027.95	432.17	2030.83	432.15	2040.98	432.28	2048.24	432.31
2053.88	432.27	2065.12	432.26	2071.2	432.21	2079.64	432.12	2082.52	432.12
2092.62	432	2099.93	431.85	2105.6	431.66	2117.33	431.08	2118.59	431.06
2131.6	431.09	2134.74	431.09	2151.61	431.22	2157.27	431.3	2169.02	431.39
2170.3	431.41	2183.29	431.48	2203.83	431.48	2209.26	431.44	2221.23	431.39
2234.93	431.35	2238.11	431.35	2272.92	431.29	2290.33	431.24	2300.01	431.24
2307.73	431.2	2312.92	431.19	2324.61	431.24	2338.67	431.14	2351.65	431.08
2359.42	431.02	2364.63	431.01	2376.82	431.03	2390.63	431.11	2403.45	431.27
2416.3	431.32	2429.33	431.4	2442.32	431.3	2445.92	431.29	2463.32	431.27
2468.28	431.29	2481.25	431.28	2493.98	431.32	2497.6	431.38	2506.92	431.46
2532.41	431.58	2532.98	431.59	2546.01	431.6	2549.82	431.61	2559.04	431.67
2567.22	431.68	2584.1	431.75	2597.7	431.75	2601.5	431.71	2610.68	431.46
2636.31	431.28	2649.67	431.26	2653.72	431.29	2661.5	431.41	2685.2	431.52
2688.36	431.56	2701.35	431.89	2705.41	431.85	2714.33	431.71	2722.81	431.83
2727.31	431.82	2740.5	431.91	2765.95	431.73	2774.5	431.71	2791.68	431.79
2805.05	431.87	2817.88	431.75	2826.71	431.75	2831.01	431.74	2844.19	431.84
2861	431.92	2869.7	431.73	2895.81	431.69	2908.7	431.86	2913.21	431.93
2934.36	432.32	2947.1	432.44	2964.9	432.41	2973.35	432.38	2982.3	432.33
2999.71	432.13	3002.73	432.13	3025.99	432.1	3040.42	432.02	3050.01	432.11
3051.4	432.11	3064.08	431.77	3068.8	431.82	3077.11	431.96	3086.21	431.95
3101.85	432.01	3115.75	431.97	3120.49	432.02	3137.89	432.05	3152.91	430.66
3155.3	430.43	3172.7	430.43	3180.58	430.69	3189.58	430.88	3193.4	430.93

3206.99	431.26	3219.4	431.52	3224.39	431.57	3232.38	431.58	3245.36	431.53
3258.35	431.54	3259.2	431.53	3271.1	431.5	3276.08	431.48	3284.02	431.39
3307.67	431.48	3310.89	431.48	3323.11	431.45	3336.14	431.39	3345.7	431.28
3349.09	431.25	3359.52	431.3	3364.16	431.28	3379.98	431.17	3397.38	430.98
3400.74	430.92	3410.58	430.82	3414.79	430.8	3426.76	430.72	3432.19	430.6
3439.62	430.53	3449.07	430.59	3452.43	430.69	3462.42	430.63	3466.48	430.66
3478.43	430.83	3483.88	430.87	3504.39	431.13	3517.38	431.23	3518.69	431.26
3530.15	431.4	3535.57	431.45	3543.05	431.38	3552.97	431.33	3556.08	431.33
3565.33	431.26	3570.38	431.24	3587.78	431.26	3595.17	431.23	3605.19	431.23
3608.13	431.26	3620.85	431.3	3633.8	431.28	3639.47	431.35	3646.78	431.46
3656.88	431.47	3659.77	431.49	3674.28	431.5	3685.79	431.44	3698.66	431.31
3720.09	431.29	3725.97	431.3	3737.45	431.38	3743.37	431.38	3750.43	431.42
3760.78	431.43	3763.41	431.42	3776.41	431.48	3789.19	431.32	3812.46	431.12
3815.11	431.12	3847.27	431.25	3864.68	431.22	3879.89	431.14	3892.83	431.14
3898.96	431.2	3905.81	431.22	3918.79	431.23	3931.79	431.13	3933.77	431.1
3944.82	431.11	3951.18	431.14	3957.7	431.14	3968.05	431.18	3970.49	431.17
3983.5	431.16	3985.46	431.14	4020.27	431.04	4035.45	430.99	4037.67	430.97
4048.23	430.8	4061.11	430.73	4071.96	430.64	4074.14	430.63	4087.17	430.52
4089.36	430.48	4100.2	430.23	4106.77	430.2	4113.23	430.07	4124.17	430.96
4126.22	431.15	4132.5	431.34	4138.93	431.56	4141.05	431.73	4151.86	432.87
4158.45	433.11	4164.84	433.31	4177.82	433.54	4183.56	433.59	4193.26	433.69
4203.86	433.84	4210.67	433.96	4216.74	434.09	4229.52	434.39	4242.52	434.61
4244.95	434.69	4255.51	435.1	4262.35	435.52	4276.29	436.85	4279.76	437.1
4281.47	437.32	4286.47	438.22	4294.48	439.63	4297.16	440.18	4307.27	443
4314.04	444.8	4320.14	446.35	4331.45	449.13	4333.17	449.47	4346.2	452.36
4348.85	453.01	4359.23	455.1	4366.26	456.5	4372.27	457.89	4383.66	461
4385.26	461.53	4390.16	462.71	4397.96	464.72	4400.54	465.02	4410.88	465.76
4417.94	465.67	4423.86	465.02	4435.35	463.54	4436.84	463.33	4443.7	462.73
4444.4	462.77								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1478.79	.04	1574.63	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1478.79	1574.63	460	497	900	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
280	1320	436	F
1944	3775	436	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1600

INPUT
Description:
Station Elevation Data num= 441

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.32	2.04	436.18	18.54	433.35	26.39	431.64	35.04	429.99
51.54	427.75	59.58	428.01	68.04	428.15	75.93	428.7	84.04	429.35
92.27	429.5	100.54	429.61	117.04	429.58	133.54	429.8	142.06	430.15
150.04	430.41	158.39	431.02	166.04	431.61	174.75	432.16	182.54	432.52
191.35	432.77	199.04	433.2	215.54	433.45	224.54	433.45	240.86	433.63
248.04	433.66	257.23	433.62	264.54	433.72	273.83	433.74	281.04	433.7
290.43	433.72	297.54	433.8	307.02	433.81	323.33	433.76	330.04	433.78
339.71	433.88	346.54	433.87	356.31	433.76	363.04	433.72	372.91	433.72
379.54	433.69	389.5	433.67	396.04	433.6	405.79	433.55	412.04	433.57
428.54	433.36	438.79	433.2	445.04	433.08	455.39	433.08	461.54	433.05
471.99	432.89	478.04	432.82	494.04	432.58	510.54	432.5	521.27	432.54
527.04	432.61	543.55	433.17	554.47	433.26	560.05	433.28	570.73	433.43
576.05	433.54	587.16	433.46	592.55	433.36	609.05	433.23	620.35	433.02
625.55	432.88	636.95	432.73	653.19	432.65	658.05	432.64	669.64	432.53
686.24	432.28	691.05	432.19	702.83	432.1	707.55	432.11	719.43	432.35
724.05	432.42	735.66	432.71	740.05	432.78	752.12	432.88	756.55	432.9
773.05	433.03	785.31	433.1	789.55	433.16	806.05	433.36	822.05	433.52
834.6	433.66	838.55	433.69	855.05	433.72	871.55	433.51	888.05	432.95
900.6	432.46	904.05	432.34	917.08	432.38	920.55	432.38	933.68	432.8
937.05	432.89	953.55	433.06	970.05	433.14	983.06	433.35	986.05	433.38
1002.55	433.62	1016.16	433.97	1019.05	434.02	1032.76	434.17	1035.55	434.22
1052.05	434.37	1068.05	434.41	1082.05	434.62	1101.05	434.99	1117.55	435.43
1131.84	435.66	1150.06	436.07	1166.56	436.22	1181.12	436.32	1183.06	436.35
1197.72	436.44	1214.32	436.56	1232.06	436.65	1249.82	436.68	1257.04	436.66
1270.87	436.66	1281.44	436.59	1287.05	436.57	1293.61	436.5	1305.99	436.44
1317.75	436.31	1323.71	436.28	1329.86	436.2	1341.65	436.16	1354.32	435.7
1360.93	435.39	1366.55	435.1	1379.54	434.22	1390.94	433.83	1398.16	433.57
1403	433.31	1412.43	432.97	1414.94	432.92	1427.14	433.02	1434.82	432.96
1439.37	432.86	1453.43	432.93	1463.75	432.67	1472.04	432.43	1475.91	432.4
1488.1	432.36	1490.65	432.37	1500.14	432.29	1508.7	432.33	1513.21	432.26
1525.28	432.14	1541.78	432.23	1546.64	432.22	1558.28	432.27	1561	432.48
1581	432.28	1596	428.55	1614	422.75	1664	422.75	1690.08	431.44
1696.86	431.4	1705.82	431.43	1713.19	431.64	1722.32	431.88	1731.63	431.57
1745.65	431.33	1764.47	431.33	1773.59	431.14	1784.61	431.08	1796.25	430.85
1804.89	430.7	1814.59	430.7	1821.26	430.8	1823.67	430.76	1830.71	430.85
1892.63	431.85	1907.82	431.88	1917.09	431.86	1930.3	431.92	1946.12	431.93
1952.96	431.97	1962.73	431.99	1985.47	432.14	1998.61	432.15	2010.7	432.17

2015.16	432.21	2036.17	432.24	2050.47	432.17	2061.74	432.25	2068.13	432.18
2073.63	432.17	2093.82	432.17	2099.83	432.13	2113.15	432.49	2121.19	432.64
2138.22	434.15	2155.87	434.61	2164.19	434.84	2173.53	435.08	2184.72	435.13
2188.83	435.26	2216.38	432.37	2263.44	432.45	2282.5	432.42	2293.34	432.43
2313.71	432.41	2331.37	432.25	2349.02	432.25	2366.15	432.02	2417.61	432.46
2419.12	432.48	2436.77	432.48	2459.36	431.97	2468.19	431.69	2471.55	431.69
2489.21	431.99	2493.76	432.04	2505.72	431.99	2506.86	432	2519.33	432.57
2524.52	432.52	2531.95	432.48	2541.64	432.52	2544.52	432.44	2552.07	432.4
2557.28	432.35	2570.01	432.33	2576.95	432.29	2594.61	432.45	2608.26	432.61
2620.85	432.63	2633.44	432.61	2647.04	432.67	2658.95	432.55	2671.68	432.55
2684.41	432.59	2697.18	432.54	2700.01	432.54	2709.74	432.49	2717.13	432.49
2722.36	432.45	2734.79	432.49	2760.72	432.46	2773.51	432.51	2787.76	432.5
2798.76	432.45	2811.36	432.45	2822.54	432.4	2836.86	432.37	2849.65	432.42
2862.43	432.45	2875.51	432.58	2887.67	432.61	2910.28	432.49	2920.11	432.4
2925.78	432.32	2927.94	432.32	2938.57	432.24	2951.35	432.2	2966.47	432.14
2976.62	432.08	2980.37	432.08	2998.03	432.14	3012.83	432.36	3027.62	432.64
3033.34	432.78	3046.78	432.62	3071.06	432.29	3103.1	432.6	3104.84	432.59
3118.47	432.26	3153.01	433.5	3154.4	433.61	3155.87	433.5	3169.84	433.33
3173.52	433.27	3187.7	432.66	3191.18	432.48	3196.85	432.51	3205.53	432.64
3208.84	432.64	3218.32	432.7	3226.49	432.77	3256.23	432.79	3261.27	432.85
3268.96	432.74	3278.93	432.77	3288.86	432.76	3294.45	432.73	3296.58	432.64
3307.24	432.53	3314.24	432.57	3319.9	432.49	3331.36	432.46	3335.21	432.47
3345.17	432.57	3349.02	432.55	3357.9	432.64	3370.63	432.66	3384.33	432.83
3396.16	432.86	3408.79	432.96	3419.11	433.96	3421.35	433.99	3427.22	435.43
3434.13	436.92	3436.76	436.92	3439.03	436.43	3442.71	436.27	3485.01	433.43
3492.47	433.07	3506.85	433.07	3524.51	432.99	3535.84	433.06	3542.17	433.03
3559.82	433.09	3565.59	432.99	3577.48	432.7	3586.69	432.51	3594.6	432.48
3599.24	432.54	3611.24	432.66	3629.91	433.02	3647.57	433.2	3650.34	433.25
3663.12	433.36	3675.67	433.34	3682.35	433.31	3688.31	433.31	3700	433.38
3717.66	433.44	3735.32	433.47	3739.3	433.5	3752.97	433.54	3764.57	433.5
3770.09	433.54	3777.23	433.55	3790.02	433.43	3795.96	433.43	3805.41	433.39
3823.06	433.33	3828.24	433.39	3841.62	433.35	3853.46	433.41	3857.84	433.41
3875.5	433.24	3887.97	433.26	3904.51	433.3	3917.3	433.38	3928.47	433.4
3934.33	433.35	3945.59	433.22	3955.18	433.03	3963.24	432.94	3980.9	432.88
3993.43	432.93	4006.22	433.03	4026.34	433.1	4031.43	433.11	4044.11	433.22
4056.85	433.25	4068.65	433.24	4082.35	433.14	4086.3	433.13	4103.96	433.24
4121.08	433.3	4133.11	433.31	4158.68	433.12	4171.44	433.08	4174.05	433.06
4184.17	433.1	4191.71	433.16	4196.79	433.22	4208.83	433.33	4222.03	433.4
4226.48	433.38	4234.82	433.44	4247.61	433.38	4261.79	433.35	4273.11	433.18
4279.45	433.12	4285.7	433.14	4296.57	433.13	4302.37	433.15	4314.23	433.16
4323.74	433.02	4348.72	433.08	4362.1	433.07	4367.2	433.04	4387.29	433.05
4401.98	433	4419.63	432.73	4425.52	432.66	4440.73	432.57	4451.02	432.48
4454.94	432.48	4463.61	432.4	4472.07	432.16	4476.21	431.99	4487.09	431.7
4488.99	431.61	4501.72	430.51	4507.38	429.85	4514.45	428.93	4525.04	429.42
4527.19	429.43	4532.74	430.12	4539.95	430.88	4552.51	432.9	4559.81	433.66
4565.13	434.42	4577.47	435.03	4590.71	435.43	4603.49	435.85	4612.78	436.06
4616.28	436.12	4630.44	436.28	4641.53	436.39	4647.56	436.5	4654.13	436.67
4666.86	437.19	4679.63	438.12	4682.87	438.51	4692.41	439.8	4700.53	441.99
4705.2	443.3	4718.19	446.37	4730.44	449.57	4735.31	450.92	4743.06	453.26
4752.96	456.67	4763.12	460.37	4768.55	462.37	4770.62	462.94	4781.34	465.4
4788.27	465.61	4794.12	465.66	4805.93	464.69	4811.01	464.19	4814.68	463.42
4826.65	463.33								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1581	.04	1690.08	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1581	1690.08	700	502	530	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
340	1250	438	F
2173	4248	438	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1098

INPUT
Description:
Station Elevation Data num= 446

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.02	13.11	433.96	29.61	430.92	46.11	428.9	62.69	428.9
79.12	429.17	95.12	429.51	128.13	429.27	146.54	429.46	177.14	429.87
179.77	429.88	193.65	430.01	196.64	430.11	210.15	430.39	213.52	430.39
226.66	430.48	243.16	430.7	247.13	430.73	259.16	430.9	263.62	431.11
275.67	431.57	280.49	431.99	292.17	432.68	297.36	432.78	308.68	433.2
314.23	433.23	325.18	433.19	330.92	433.12	347.47	433.16	357.69	433.11
374.19	433.18	381.21	433.25	390.69	433.23	398.08	433.24	407.2	433.39
423.2	433.31	431.31	433.35	439.71	433.45	456.21	433.7	472.71	433.77
481.93	433.97	489.22	434.09	498.5	434.29	505.22	434.35	515.16	434.3
521.73	434.33	532.03	434.2	548.91	434.13	554.73	434.13	565.78	434.28
571.24	434.32	582.3	434.36	587.24	434.4	599.01	434.37	603.75	434.34
615.88	434.22	632.75	434.07	653.26	434.04	669.26	433.94	685.76	433.72
716.6	433.58	733.47	433.55	751.28	433.49	766.7	433.59	784.29	433.63
800.45	433.42	817.3	433.32	833.68	433.32	867.42	432.87	882.81	432.8

884.3	432.9	901.11	433.83	915.32	434.78	917.53	434.82	931.82	435.18
951.27	435.27	964.83	435.31	968.14	435.35	981.34	435.39	997.34	435.7
1001.37	435.76	1013.84	435.88	1018.25	435.87	1030.35	435.94	1046.85	436.18
1063.35	436.39	1079.36	436.43	1085.22	436.36	1102.09	436.36	1118.96	436.47
1128.87	436.55	1135.84	436.68	1145.37	436.81	1152.48	436.95	1185.94	437.52
1210.89	437.71	1219.68	437.56	1227.39	437.49	1236.27	437.19	1243.4	437.03
1252.92	436.97	1259.9	436.86	1269.79	436.76	1276.41	436.63	1286.66	436.34
1292.91	436.19	1303.53	435.99	1309.41	435.93	1320.06	435.77	1336.76	435.57
1341.92	435.49	1353.64	435.45	1370.51	435.45	1374.93	435.48	1387.38	435.19
1391.43	435.08	1403.85	434.94	1407.44	434.92	1420.61	434.1	1423.94	433.95
1440.44	432.74	1454.36	432.85	1456.95	432.83	1471.23	431.98	1487.65	431.78
1489.46	431.72	1504.46	430.99	1505.96	430.95	1516	430.07	1545	427.65
1551	425.31	1555.09	424.39	1557.87	423.46	1563	421.75	1613	421.75
1637.12	429.79	1637.47	429.77	1653.54	430.68	1667.47	430.55	1670.27	430.55
1681.8	430.31	1686.99	430.16	1696.14	430.35	1703.72	430.34	1710.47	430.19
1724.69	430.19	1736.67	430.22	1738.71	430.3	1753.04	430.26	1767.38	430.71
1770.13	430.73	1781.72	430.6	1786.86	430.68	1796.05	430.7	1803.58	430.76
1810.21	431.1	1819.92	431.34	1823.68	431.34	1837.05	431.05	1850.44	431.19
1863.79	431.2	1877.15	431.3	1888.43	431.28	1905.03	431.1	1922.16	431.15
1930.27	431.26	1943.67	431.36	1959.41	431.53	1970.43	431.68	1983.54	431.64
1990.15	431.66	1996.73	431.58	2007.27	431.77	2020.04	431.83	2023.45	431.82
2036.85	431.68	2041.53	431.65	2050.25	431.38	2058.65	431.45	2063.53	431.56
2076.64	431.51	2090.04	431.62	2103.44	431.34	2116.84	431.4	2130.24	431.39
2143.77	431.57	2156.68	431.67	2160.38	431.59	2177.5	431.61	2183.29	431.56
2196.65	431.55	2211.75	431.67	2223.42	431.59	2228.88	431.62	2236.63	431.59
2249.82	431.71	2262.62	431.7	2276.58	431.55	2279.74	431.54	2289.93	431.58
2296.87	431.57	2303.29	431.6	2316.58	431.53	2330.6	431.84	2347.73	431.84
2356.4	431.59	2364.86	431.37	2369.8	431.34	2381.98	431.32	2383.2	431.35
2396.6	431.36	2399.11	431.39	2409.74	431.84	2415.72	432.12	2422.99	432.28
2432.84	432.47	2436.39	432.41	2449.97	431.99	2463.14	431.89	2474.17	431.64
2484.22	431.12	2500.83	431.68	2502.8	431.73	2509.76	431.68	2516.17	431.68
2517.96	431.73	2537.04	432.64	2552.21	432.47	2556.37	432.37	2569.34	432.51
2582.8	432.45	2596.08	432.19	2603.07	432.36	2609.43	432.37	2620.2	432.52
2626.41	432.48	2631.96	432.48	2671.75	432.06	2688.18	432.17	2716.14	432.17
2722.44	432.15	2742.86	432.04	2773.3	432.05	2782.64	431.96	2796	432.15
2807.55	432.03	2809.35	432.05	2824.68	432.04	2835.85	432.14	2841.28	432.14
2849.12	432.24	2858.41	432.48	2875.54	432.56	2889.28	432.34	2892.66	432.36
2902.63	432.35	2909.79	432.37	2915.84	432.46	2926.4	432.49	2928.94	432.45
2943.53	432.46	2955.7	432.53	2960.65	432.62	2978.58	433.01	2981.26	433.05
2993.57	433.01	2997	433.15	3005.7	433.19	3014.86	432.84	3023.77	433.04
3030.09	433.23	3033.28	433.16	3051.71	433.2	3070.13	433.09	3088.55	433.21
3103.46	433.2	3106.41	433.18	3115.64	433.01	3124.84	433.06	3133.95	433.03
3143.26	432.96	3152.48	432.97	3164.79	432.88	3177.1	433	3180.1	432.96
3189.22	432.91	3197.97	432.92	3201.34	432.9	3213.63	432.99	3216.39	432.96
3234.81	432.94	3253.23	433.08	3262.71	433.01	3281.78	433.02	3289.52	432.97
3299.17	432.98	3307.94	433.17	3311.42	433.18	3323.7	433.07	3336.01	433.2
3344.79	432.89	3348.31	432.93	3355.42	432.95	3360.62	433.14	3381.07	433.13
3406.76	434.32	3421.65	434.77	3429.06	434.64	3433.92	434.47	3436.34	434.51
3446.23	434.52	3466.16	434.5	3472.62	434.51	3479.1	434.48	3509.47	433.5
3512.84	433.6	3521.53	433.62	3552.34	434.24	3568.08	433.64	3583.51	432.62
3593.48	431.83	3600.27	431.27	3621.92	433.32	3667.67	433.86	3674.15	433.97
3727.67	433.34	3763.5	434.26	3765.7	434.03	3767.18	433.99	3770.21	433.6
3784.13	432.78	3788.71	432.46	3797.81	432.39	3802.55	432.6	3813.29	433.16
3820.97	433.16	3825.5	433.33	3837.55	433.72	3849.77	433.84	3862.02	433.67
3874.28	434	3886.59	434.77	3894.1	435.12	3898.9	435.01	3908.55	435.16
3911.21	435.13	3923.29	434.73	3926.13	434.58	3937.67	434.28	3996.78	434.12
3999.7	434.04	4004.08	434.58	4009.02	434.51	4021.94	434.23	4033.3	434.24
4040.36	433.67	4043.46	433.33	4058.79	431.1	4063.66	430.86	4108.11	444.04
4117.99	444.52	4141.37	443.33	4149.18	442.86	4160.46	441.07	4205.05	440.12
4211.61	440.48	4223.47	441.84	4234.22	444.43	4265.24	442.08	4314.69	434.98
4323.89	434.74	4327.06	434.77	4333.44	434.76	4350.95	434.62	4363.87	434.65
4376.06	434.6	4388.05	434.74	4406.58	434.86	4425	434.86	4443.42	434.57
4449.48	434.52	4461.69	434.46	4473.85	434.42	4479.71	434.43	4486.04	434.4
4510.6	434.15	4516.55	434.12	4522.84	434.14	4535.32	434.12	4553.39	434.27
4571.26	434.29	4583.9	434.23	4596.14	434.25	4620.7	434.22	4633.01	434.12
4662.81	433.72	4681.23	433.38	4699.65	432.88	4719.7	432.22	4730.93	431.82
4736.5	431.71	4743.1	431.4	4755.17	430.97	4767.43	430.31	4779.67	430.09
4791.21	428.76	4804.22	427.73	4809.63	427.72	4816.53	428.05	4828.05	429
4828.83	429.04	4845.92	431.31	4853.09	432.2	4864.34	433.52	4865.4	433.7
4867.54	433.86	4877.66	434.77	4882.76	435.17	4901.18	436.18	4919.6	437.8
4926.62	437.97	4937.47	438.14	4950.96	438.58	4955.89	438.68	4963.21	439.45
4974.31	442.05	4977.72	442.56	4987.75	444.13	4992.74	444.87	5000.06	446.21
5011.16	448.64	5012.35	449.01	5014.82	450.05	5024.4	453.93	5029.02	456.2
5036.62	458.98	5047.44	462.02	5048.93	462.46	5051.92	463.17	5061.19	465.58
5073.44	465.15	5084.29	463.43	5088.85	462.62	5090.54	462.65	5091.15	462.52
5099.68	462.51								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1545	.04	1637.12	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1545	1637.12	510	360	381	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
2330	4108	438	F

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 738

INPUT
Description:
Station Elevation Data num= 448

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	434.97	8.43	433.71	24.06	429.99	25.28	429.72	29.91	429.31
42.12	428.3	45.28	428.45	58.97	428.95	66.47	429.3	75.81	429.79
87.22	429.51	108.99	429.11	125.83	429.53	142.68	430.06	159.52	430.34
171.58	430.86	175.86	430.99	192.7	431.16	213.89	431.3	226.39	431.23
235.09	431.32	243.23	431.35	255.79	431.49	274.74	431.45	276.84	431.43
293.26	431.59	298.04	431.67	310.1	431.65	319.24	431.78	339.92	431.83
343.28	431.88	356.77	431.95	361.01	431.95	376.97	432.54	382.29	432.51
393.81	432.95	403.57	433.02	410.66	432.44	424.31	432.97	426.99	432.95
437.55	432.99	445.46	432.92	460.68	432.56	466.66	432.46	487.85	432.04
494.37	432	510.7	432.01	519.57	432.15	526.17	432.29	540.11	432.48
544.39	432.48	561.23	432.34	567.98	432.22	581.82	432.13	611.26	431.71
628.1	431.5	635.27	431.43	656.47	431.3	661.79	431.29	678.12	431.15
682.38	431.14	711.81	431.22	719.42	431.22	740.62	431.37	745.5	431.42
760.66	431.67	767.94	431.89	778.46	432.25	795.15	433.12	811.85	433.52
820.07	433.57	828.55	433.67	839.49	433.53	844.74	433.42	859.12	433.64
861.44	433.65	873.8	434.1	878.93	434.26	894.83	434.68	911.53	434.79
927.72	434.99	937.64	435.05	944.42	435.14	957.41	435.14	977.82	435.44
994.52	435.33	1010.71	435.5	1016.22	435.54	1027.41	435.73	1044.1	435.89
1055.87	435.95	1077.5	436.01	1094.89	436.23	1127.09	436.57	1134.43	436.72
1143.78	436.86	1160.48	437.2	1176.67	437.36	1193.14	437.27	1210.07	437.29
1212.91	437.26	1226.77	437.22	1232.68	437.11	1243.47	436.85	1252.12	436.57
1259.66	436.36	1271.61	436.22	1276.36	436.1	1293.05	435.81	1309.75	435.76
1326.45	435.35	1342.64	435.26	1359.34	435.14	1376.04	435.06	1392.74	434.95
1409.43	434.73	1428.87	433.33	1442.3	431.88	1447.7	430.89	1458.83	429.19
1517.84	426.42	1540.72	425.34	1554	421.03	1584	421.03	1604	421.03
1642.79	427.29	1656.29	429.6	1659.55	429.83	1672.33	431.04	1676.89	431.05
1688.87	431.14	1705.41	430.51	1714.76	430.94	1729.98	431.3	1744.14	431.39
1754.87	431.37	1771.65	431.14	1786.3	431.08	1788.43	431.04	1800.47	431.02
1805.2	431.07	1814.64	431.09	1821.98	430.98	1828.63	430.84	1838.25	430.89
1842.55	430.84	1855.03	430.89	1885.01	430.94	1888.58	430.91	1899.15	430.98
1905.36	431.33	1913.08	431.6	1921.63	431.55	1938.4	431.9	1955.74	431.92
1969.44	432.05	1983.61	432.07	1988.73	432.11	2005	432.11	2011.52	432.16
2025.69	432.2	2038.55	432.28	2054.03	432.27	2072.11	432.35	2082.1	432.34
2105.15	432.18	2155.48	431.86	2166.6	431.91	2171.75	431.88	2180.6	431.93
2188.53	432.02	2208.87	431.96	2237.17	431.97	2238.86	431.96	2255.13	432.12
2265.08	432.24	2271.91	432.36	2279.25	432.37	2288.68	432.23	2293.42	432.3
2305.46	432.04	2319.15	435.05	2322.24	435.76	2335.54	433.57	2338.51	433.23
2349.6	432.51	2355.28	431.84	2363.73	431.69	2372.06	431.35	2377.87	431.27
2388.84	431.33	2406.13	431.21	2432.38	430.9	2438.66	430.71	2448.21	430.55
2455.44	430.33	2472.21	430.24	2476.55	430.36	2488.99	431.07	2490.68	431.06
2500.16	431.24	2505.26	431.3	2518.64	431.17	2522.03	431.25	2532.81	431.19
2538.81	431.19	2546.98	431.62	2555.59	432.69	2561.15	432.75	2572.37	433.24
2575.24	433.28	2588.63	432.09	2589.37	432.09	2611.84	431.11	2622.19	431.12
2627.19	431.03	2643.23	431.17	2672.01	431.98	2681.17	431.8	2701.77	431.3
2715.94	431.17	2722.34	431.18	2730.11	431.53	2739.12	431.66	2744.15	431.67
2755.39	432.09	2772.37	432.15	2786.33	431.93	2800.47	432.08	2805.72	432.04
2814.6	432.04	2822.49	431.93	2828.58	431.8	2854.01	431.85	2856.58	431.9
2862.19	431.74	2872.32	431.58	2884.91	431.85	2889.09	431.86	2905.87	431.77
2913.06	431.98	2922.14	432.1	2926.99	432.1	2941.16	432.23	2972.47	432.37
2989.25	432.6	3005.51	432.88	3022.29	433.06	3025.75	433.12	3039.07	433.2
3054.07	433.13	3072.62	433.16	3082.09	433.78	3088.89	433.84	3096.05	433.85
3105.67	433.82	3122.44	433.88	3134.4	433.5	3139.22	433.41	3152.19	433.84
3164.06	433.69	3176.18	433.7	3187.8	433.67	3194.94	433.59	3214.22	433.53
3223.73	433.55	3235.74	433.69	3252.8	433.55	3259.64	433.56	3295.31	433.24
3302.68	433.07	3310.07	432.96	3319.3	432.9	3331.32	432.88	3359.9	433.28
3372.48	435.42	3388.52	434.11	3397.79	433.5	3405.92	433.6	3414.87	433.6
3425.21	433.76	3426.89	434.11	3429.66	434.24	3438.85	435.24	3444.5	434.91
3450.68	435.28	3453.56	435.01	3462.66	436.45	3518.84	441.14	3521.06	441.05
3524.29	441.31	3540.35	441.31	3556.15	440.27	3569.97	440	3578.34	438.96
3581.99	438.58	3593.97	437.19	3597.63	437.48	3605.91	437.71	3616.91	434.56
3619.4	434.38	3636.2	433.48	3641.77	432.63	3654.9	431.34	3674.19	429.5
3682.65	430.61	3689.39	432.37	3693.48	432.27	3710.08	432.31	3716.71	432.42
3754.75	433.3	3770.04	433.79	3777.76	433.97	3789.33	434.1	3796.98	434.04
3808.61	434.28	3809.63	434.26	3827.9	433.17	3832.8	433.06	3846.6	433.57
3856.51	433.64	3865.89	433.79	3872.87	433.87	3885.18	433.96	3892.55	433.97
3904.46	433.91	3916.51	434.62	3923.75	434.77	3928.37	435.08	3936.12	435.01
3942.45	435.17	3952.08	436.58	3961.74	436.12	3967.99	435.69	3976.06	435.54
3981.03	436.03	3988.01	436.58	3999.37	434.71	4000.31	434.65	4016.19	434.94
4023.1	434.61	4050.23	434.58	4071.21	435.07	4076.88	434.99	4094.48	434.86
4096.16	434.88	4107.54	434.82	4115.45	434.89	4133.92	434.85	4169.91	434.84
4190.86	434.73	4211.3	434.73	4239.23	434.37	4245.79	434.77	4268.72	434.78
4277.31	434.85	4301.26	436.37	4355.41	436.19	4364.43	435.78	4379.82	435.55
4382.25	435.48	4393.01	433.84	4438.54	432.18	4457.01	431.12	4479.56	430.4
4489.65	430.4	4498.85	430.96	4501.61	431.16	4506.32	431.35	4517.55	431.92
4525.33	432.14	4536.84	432.32	4544.49	432.86	4556.13	433.91	4563.77	434.07
4575.42	433.95	4632.59	435.54	4644.75	435.37	4651.98	435.32	4668.78	435.31
4680.8	435.19	4692.77	435.12	4704.51	434.96	4728.54	434.79	4747.83	434.5
4764.33	434.19	4776.28	434.07	4786.41	434.11	4799.96	433.83	4805.11	433.63
4811.87	433.16	4824.4	432.49	4835.9	431.96	4843.68	431.55	4847.91	431.16

4854.91	430.72	4859.9	430.33	4862.97	430.23	4871.85	429.17	4882.26	426.43
4883.76	426.12	4886.29	425.9	4895.53	425.39	4900.96	424.97	4907.44	425.42
4918.15	427.21	4920.25	427.59	4931.39	428.87	4939.53	429.06	4948.91	430.4
4953.08	430.93	4981.4	432.83	5001.46	432.95	5013.27	433.07	5026.27	433.16
5044.65	434.24	5051	434.38	5073.96	435.77	5076.52	435.88	5092.66	435.97
5098.46	435.95	5107.9	436.01	5122.43	435.99	5134.45	435.91	5146.46	435.96
5158.48	435.93	5169.81	435.83	5182.21	435.53	5194.03	435.29	5207.8	435.26
5218.01	435.18	5227.08	435.14	5234.88	436.92	5256.6	442.18	5266.26	445.64
5280.4	449.23	5298.12	456.07	5304.31	457.87	5322.93	465.09	5325.59	465.39
5329.99	465.51	5337.56	465.54	5342.22	465.18	5349.51	465.14	5361.51	464.82
5373.24	463.05	5374.19	462.79	5388.84	462.77				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1458.83	.04	1672.33	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1458.83	1672.33	0	0	0	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
394	1160	438	F
1730	4632	438	F

SUMMARY OF MANNING'S N VALUES

River:Thompsons

Reach	River Sta.	n1	n2	n3
Thompsons	4901	.1	.04	.1
Thompsons	4602	.1	.04	.1
Thompsons	4104	.1	.04	.1
Thompsons	3597	.1	.04	.1
Thompsons	3098	.1	.04	.1
Thompsons	2597	.1	.04	.1
Thompsons	2097	.1	.04	.1
Thompsons	1600	.1	.04	.1
Thompsons	1098	.1	.04	.06
Thompsons	738	.1	.04	.06

SUMMARY OF REACH LENGTHS

River: Thompsons

Reach	River Sta.	Left	Channel	Right
Thompsons	4901	300	299	290
Thompsons	4602	517	498	440
Thompsons	4104	650	507	490
Thompsons	3597	510	499	584
Thompsons	3098	690	501	980
Thompsons	2597	760	500	410
Thompsons	2097	460	497	900
Thompsons	1600	700	502	530
Thompsons	1098	510	360	381
Thompsons	738	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Thompsons

Reach	River Sta.	Contr.	Expan.
Thompsons	4901	.1	.3
Thompsons	4602	.1	.3
Thompsons	4104	.1	.3
Thompsons	3597	.1	.3
Thompsons	3098	.1	.3
Thompsons	2597	.1	.3
Thompsons	2097	.1	.3
Thompsons	1600	.1	.3
Thompsons	1098	.1	.3
Thompsons	738	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl

			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Thompsons	4901	100 year	2740.00	430.75	437.47		438.01	0.002842	5.95	506.36	237.34	0.45
Thompsons	4901	25 year	2170.00	430.75	436.95		437.37	0.002452	5.25	413.11	83.36	0.42
Thompsons	4901	10 year	1820.00	430.75	436.39		436.77	0.002416	4.95	367.80	80.38	0.41
Thompsons	4901	5 year	1510.00	430.75	435.82		436.16	0.002428	4.67	323.07	77.33	0.40
Thompsons	4901	2 year	1050.00	430.75	434.87		435.14	0.002457	4.17	251.50	72.17	0.39
Thompsons	4602	100 year	2680.00	430.00	436.52		437.12	0.003145	6.22	456.41	275.02	0.48
Thompsons	4602	25 year	2190.00	430.00	436.14		436.61	0.002664	5.48	399.51	80.15	0.43
Thompsons	4602	10 year	1850.00	430.00	435.59		436.01	0.002649	5.19	356.54	77.47	0.43
Thompsons	4602	5 year	1530.00	430.00	435.04		435.41	0.002628	4.87	314.12	74.73	0.42
Thompsons	4602	2 year	1060.00	430.00	434.08		434.37	0.002630	4.32	245.20	70.06	0.41
Thompsons	4104	100 year	2680.00	428.75	434.28	432.78	435.11	0.005209	7.30	367.37	1134.21	0.60
Thompsons	4104	25 year	2190.00	428.75	434.92	432.30	435.34	0.002364	5.23	419.03	1171.77	0.41
Thompsons	4104	10 year	1850.00	428.75	434.39	431.95	434.77	0.002321	4.92	375.88	1162.63	0.40
Thompsons	4104	5 year	1530.00	428.75	433.86	431.57	434.19	0.002246	4.58	334.20	985.87	0.39
Thompsons	4104	2 year	1060.00	428.75	432.91	430.99	433.17	0.002209	4.03	262.82	664.99	0.38
Thompsons	3597	100 year	2870.00	427.50	433.94	431.80	434.01	0.000800	3.08	2903.85	1616.54	0.24
Thompsons	3597	25 year	2290.00	427.50	433.42	431.24	433.94	0.003194	5.83	392.73	1075.52	0.47
Thompsons	3597	10 year	1910.00	427.50	433.02	430.84	433.46	0.002847	5.30	360.56	1038.48	0.44
Thompsons	3597	5 year	1580.00	427.50	432.59	430.47	432.96	0.002603	4.84	326.45	986.10	0.42
Thompsons	3597	2 year	1100.00	427.50	431.68	429.86	431.96	0.002540	4.27	257.37	744.14	0.40
Thompsons	3098	100 year	2870.00	426.24	433.46		433.58	0.000878	3.49	2277.65	1188.84	0.26
Thompsons	3098	25 year	2290.00	426.24	432.65		432.85	0.001365	4.02	1345.28	1089.36	0.31
Thompsons	3098	10 year	1910.00	426.24	432.06		432.30	0.001746	4.25	843.45	659.29	0.35
Thompsons	3098	5 year	1580.00	426.24	431.48		431.77	0.002101	4.39	512.50	476.88	0.38
Thompsons	3098	2 year	1100.00	426.24	430.46		430.73	0.002407	4.15	276.96	102.83	0.39
Thompsons	2597	100 year	3060.00	425.00	432.46	429.45	432.85	0.002013	5.21	912.10	1762.03	0.39
Thompsons	2597	25 year	2400.00	425.00	431.58	428.83	431.95	0.002083	4.96	629.62	825.17	0.39
Thompsons	2597	10 year	1980.00	425.00	430.92	428.40	431.28	0.002232	4.85	475.83	354.59	0.39
Thompsons	2597	5 year	1630.00	425.00	430.32	428.01	430.65	0.002312	4.64	361.13	154.24	0.40
Thompsons	2597	2 year	1110.00	425.00	429.26	427.36	429.53	0.002367	4.15	267.59	75.57	0.39
Thompsons	2097	100 year	3060.00	423.75	431.44	428.19	431.85	0.001903	5.24	825.99	1489.89	0.38
Thompsons	2097	25 year	2400.00	423.75	430.48	427.58	430.88	0.002121	5.07	489.83	180.00	0.39
Thompsons	2097	10 year	1980.00	423.75	429.84	427.15	430.19	0.002094	4.77	415.47	86.52	0.38
Thompsons	2097	5 year	1630.00	423.75	429.24	426.76	429.55	0.002060	4.46	365.13	82.95	0.37
Thompsons	2097	2 year	1110.00	423.75	428.17	426.11	428.41	0.002081	3.97	279.55	76.52	0.37
Thompsons	1600	100 year	3300.00	422.75	430.20	427.39	430.72	0.002606	5.89	678.74	235.81	0.44
Thompsons	1600	25 year	2510.00	422.75	429.25	426.69	429.71	0.002596	5.47	492.83	141.82	0.43
Thompsons	1600	10 year	2060.00	422.75	428.63	426.23	429.04	0.002538	5.14	414.72	115.84	0.42
Thompsons	1600	5 year	1690.00	422.75	428.07	425.82	428.43	0.002470	4.80	354.35	96.46	0.41

Thompsons	1600	2 year	1120.00	422.75	427.06	425.12	427.32	0.002302	4.11	272.34	76.32	0.38
Thompsons	1098	100 year	3300.00	421.75	427.89	426.39	428.84	0.005488	7.81	424.18	100.23	0.62
Thompsons	1098	25 year	2510.00	421.75	427.04	425.69	427.83	0.005534	7.16	350.47	82.29	0.61
Thompsons	1098	10 year	2060.00	421.75	426.53	425.25	427.22	0.005364	6.65	309.71	79.49	0.59
Thompsons	1098	5 year	1690.00	421.75	426.03	424.84	426.64	0.005383	6.24	270.69	76.71	0.59
Thompsons	1098	2 year	1120.00	421.75	425.20	424.13	425.65	0.005144	5.37	208.62	71.86	0.56
Thompsons	738	100 year	3420.00	421.03	426.99	424.45	427.40	0.002502	5.20	690.91	172.81	0.42
Thompsons	738	25 year	2620.00	421.03	426.05	423.91	426.43	0.002499	4.94	543.39	146.87	0.42
Thompsons	738	10 year	2150.00	421.03	425.52	423.57	425.85	0.002501	4.62	468.80	131.82	0.41
Thompsons	738	5 year	1730.00	421.03	424.99	423.24	425.27	0.002503	4.29	403.35	114.28	0.40
Thompsons	738	2 year	1130.00	421.03	424.12	422.70	424.33	0.002504	3.69	306.27	108.51	0.39

HEC-RAS Report for Alternative 5

HEC-RAS Version 3.1.1 May 2003
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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X     X  XXXXXX   XXXX        XXXX      XX      XXXX
X     X  X       X    X       X   X    X  X    X
X     X  X       X            X   X   X    X   X
XXXXXXX  XXXX    X      XXX   XXXX    XXXXXX    XXXX
X     X  X       X            X  X    X    X        X
X     X  X       X    X       X   X   X    X        X
X     X  XXXXXX   XXXX        X    X  X    X   XXXXX
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PROJECT DATA
Project Title: Prelim. Analysis Thompson's Branch
Project File : TBrPrelim.prj
Run Date and Time: 5/16/2007 4:40:40 PM

Project in English units

PLAN DATA

Plan Title: Ext Geo 50' Channel w/ Concrete
Plan File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.p08

Geometry Title: Ext Geo 50' Channel w/ Concrete
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g10

Flow Title : Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Plan Summary Information:

Number of:				
Cross Sections =	10	Mulitple Openings =	0
Culverts =	0	Inline Structures =	0
Bridges =	0	Lateral Structures =	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow 3
Flow File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.f03

Flow Data (cfs)

River	Reach	RS	100 year	25 year	10 year	5 year	2 year
Thompsons	Thompsons	4901	2740	2170	1820	1510	1050
Thompsons	Thompsons	4602	2680	2190	1850	1530	1060
Thompsons	Thompsons	3597	2870	2290	1910	1580	1100
Thompsons	Thompsons	2597	3060	2400	1980	1630	1110

Thompsons	Thompsons	1600	3300	2510	2060	1690	1120
Thompsons	Thompsons	738	3420	2620	2150	1730	1130

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Thompsons	Thompsons	100 year		Normal S = 0.0025
Thompsons	Thompsons	25 year		Normal S = 0.0025
Thompsons	Thompsons	10 year		Normal S = 0.0025
Thompsons	Thompsons	5 year		Normal S = 0.0025
Thompsons	Thompsons	2 year		Normal S = 0.0025

GEOMETRY DATA

Geometry Title: Ext Geo 50' Channel w/ Concrete
Geometry File : p:\active\6028 Mountain Creek Flood Protection\HEC-RAS\Thompson's Branch\Prelim Analysis\TBrPrelim.g10

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4901

INPUT
Description:
Station Elevation Data num= 101

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	444.78	3.03	444.68	9.59	444.46	19.83	444.26	26.09	444.15
36.62	443.85	42.59	443.67	53.08	443.35	58.6	443.11	69.7	442.75
75.1	442.6	86.49	442.32	91.6	442.19	103.28	442.02	108.1	441.95
120.08	441.91	124.61	441.89	136.49	441.83	140.61	441.83	153.15	441.66
157.11	441.63	169.95	441.44	173.61	441.36	186.74	441.06	190.12	440.95
203.53	440.64	206.62	440.56	219.9	440.46	222.62	440.35	236.61	439.89
239.12	439.85	253.4	439.82	255.63	439.82	270.2	439.82	272.13	439.78
286.99	439.65	288.63	439.59	303.32	439.27	304.63	439.28	320.07	439.2
321.14	439.19	336.86	439.08	337.64	439.08	353.65	439.15	354.14	439.15
355.48	439.15	365	441.21	383.5	437.58	404	430.75	417.35	430.75
429.71	430.75	454	430.75	469.23	435.83	472.3	435.73	484.31	435.9
485.14	435.91	500.82	436.04	501.64	436.04	517.34	435.99	518.14	435.99
533.85	436.03	534.64	436.04	549.88	436.11	550.64	436.11	566.37	436.19
567.14	436.2	582.89	436.47	583.64	436.47	599.4	436.77	600.14	436.79
615.91	437.14	616.64	437.16	631.94	438.2	632.64	438.23	648.43	438.84
649.14	438.86	664.95	439.36	665.64	439.39	681.46	440.15	682.14	440.18
697.97	440.73	698.64	440.76	714	441.22	714.64	441.24	730.5	441.78
731.14	441.8	747.01	442.15	747.64	442.18	763.52	442.79	764.14	442.82
780.03	443.48	780.64	443.5	796.06	444.64	796.64	444.66	812.56	446.19
813.14	446.23	829.07	446.25	829.64	446.26	845.58	446.52	846.14	446.54
849.41	446.64								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	383.5	.013	469.23	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
383.5	469.23	300	299	290	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4602

INPUT
Description: XS-4602
Station Elevation Data num= 112

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	440.68	3.59	440.73	6.09	440.71	19.59	440.54	22.14	440.49
36.09	439.95	38.61	439.9	52.59	439.67	55.08	439.6	80	439.24
95.41	436.2	114	430	130.19	430	148.87	430	164	430
176.2	434.07	180	433.96	185.67	434.49	190.58	434.42	196.4	434.34
199.56	434.3	200.73	434.28	212.38	434.18	218.34	434.13	225.21	434.11
235.95	434.1	238.04	434.11	243.63	434.13	250.86	434.17	253.56	434.17
263.47	434.22	270.64	434.28	276.13	434.34	288.25	434.52	288.96	434.54

290.86	434.57	301.74	434.78	305.86	434.82	314.51	435	323.47	435.31
327.29	435.39	337.37	435.61	340.07	435.67	341.08	435.7	352.64	436.01
358.15	436.12	365.34	436.38	375.76	436.79	378.16	436.87	384.6	437.22
390.96	437.55	393.37	437.7	403.74	438.03	410.98	438.38	416.51	438.72
428.59	439.21	429.27	439.23	431.12	439.32	441.8	439.82	445.67	439.98
454.54	440.38	463.28	440.7	467.37	440.84	478.35	441.1	480.2	441.14
480.89	441.16	493.02	441.54	498.5	441.61	505.85	441.8	516.11	442.07
518.62	442.17	525.58	442.45	531.14	442.67	533.18	442.76	543.87	443.07
550.79	443.4	556.64	443.52	568.4	443.96	569.41	443.99	572.09	444.09
582.23	444.39	586.01	444.46	595.06	444.33	603.62	444.34	607.79	444.36
619.32	444.49	620.33	444.5	620.7	444.5	633.09	444.76	638.31	444.86
645.87	445.17	655.91	445.47	658.64	445.49	665.84	445.6	671.44	445.67
673.52	445.69	684.26	445.77	691.13	445.9	696.96	445.89	708.21	446.01
709.53	446.03	713.07	446.06	722.36	446.11	725.82	446.13	735.18	446.25
743.43	446.36	748.01	446.38	760.3	446.68	760.84	446.69	761.04	446.7
773.61	446.85	776.69	446.87						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	95.41	.013	176.2	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
95.41	176.2	517	498	440	.1	.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 4104

INPUT
Description: XS-4104
Station Elevation Data num= 293

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.12	6.1	435.47	11.47	434.9	22.73	433.25	27.97	432.44
39.37	431.58	44.47	431.22	55.65	431.57	60.47	431.69	72.13	431.84
76.98	431.93	88.77	431.49	93.48	431.32	105.4	430.85	109.98	430.64
122.04	430.44	126.48	430.41	138.3	430.82	142.48	430.94	154.81	431.24
158.98	431.34	171.44	431.49	175.48	431.61	200.88	431.42	208.48	431.23
220.95	431.04	224.48	431.03	237.48	431.05	240.98	431.05	254.11	431.21
257.48	431.27	270.75	431.72	273.98	431.74	287.38	432.73	290.48	432.82
303.6	431.55	306.48	431.45	320.15	432.1	322.98	432.18	336.78	432.15
339.48	432.18	353.42	431.89	355.98	431.88	370.05	431.79	372.48	431.78
386.25	431.95	388.48	431.95	402.82	432.01	404.99	432.02	419.45	432.09
421.49	432.12	436.09	432.1	437.99	432.07	452.72	432.19	454.49	432.21
468.9	432.22	470.49	432.24	485.49	432.2	486.99	432.19	502.12	431.97
503.49	431.96	518.76	431.97	519.99	431.96	535.39	431.94	536.49	431.94
551.55	431.93	552.49	431.93	568.16	432.07	568.99	432.08	584.79	432.42
585.49	432.43	601.43	432.73	601.99	432.75	618.06	432.93	618.49	432.94
634.2	433.16	634.49	433.17	650.83	433.59	650.99	433.59	667.46	434.16
667.49	434.16	671.36	434.2	683.99	434.31	684.1	434.31	700.49	434.37
700.72	434.37	716.5	434.17	716.86	434.16	733	434.09	733.49	434.09
749.5	434.03	750.12	434.04	766	434.14	766.76	434.13	782.5	433.84
783.36	433.83	798.5	433.75	799.52	433.75	815	433.8	816.15	433.81
831.5	433.96	832.78	433.94	848	433.99	856.81	433.95	946.5	433.14
948.64	433.11	962.5	432.99	964.84	432.99	979	433.02	981.47	433.01
995.5	433	998.1	433.03	1005.03	433.11	1052.01	433.71	1057.95	433.79
1061.01	433.86	1064.13	433.84	1077.51	433.8	1080.76	433.77	1094.01	433.77
1107.04	436.09	1113.92	436.88	1126.51	437.36	1130.16	437.55	1143.01	438.42
1146.79	438.58	1159.51	439.34	1163.42	439.31	1176.01	439.06	1180.06	439.09
1192.51	439.05	1196.56	439.19	1208.51	439.67	1212.82	439.85	1225.01	440.01
1229.45	440.13	1241.51	440.09	1253.38	439.93	1258.01	439.68	1272.1	439.69
1279.2	439.64	1290.51	439.66	1295.48	439.51	1307.01	439.11	1313	438.94
1334.2	435.02	1353	428.75	1403	428.75	1405.1	429.45	1408	429.52
1419	431.98	1431	432.73	1432.19	432.35	1441.17	432.81	1442.17	432.82
1447.4	432.9	1453.13	433.02	1462.22	433.19	1465.07	433.25	1466.9	433.27
1476.78	433.35	1485.81	433.43	1488.5	433.47	1492.72	433.52	1500.44	433.63
1505.31	433.67	1512.41	433.75	1523.68	433.91	1524.37	433.92	1524.81	433.92
1536.34	434.08	1544.3	434.1	1548.3	434.11	1554.65	434.19	1560.23	434.27
1563.8	434.33	1571.97	434.45	1582.71	434.57	1583.66	434.57	1585.15	434.59
1595.62	434.7	1602.21	434.76	1607.58	434.8	1616.12	434.89	1619.53	434.92
1621.71	434.95	1631.42	435.06	1641.2	435.13	1643.31	435.14	1646.62	435.17
1655.26	435.25	1660.7	435.31	1667.1	435.39	1677.58	435.52	1678.84	435.53
1679.61	435.54	1690.79	435.62	1699.11	435.69	1702.76	435.72	1708.55	435.79
1714.68	435.88	1718.61	435.91	1726.58	435.99	1738.1	436.07	1738.47	436.07
1739.05	436.07	1750.43	436.18	1757.6	436.23	1762.31	436.25	1770.02	436.29
1774.02	436.31	1776.51	436.33	1785.87	436.34	1796.01	436.28	1797.77	436.3
1800.52	436.31	1809.71	436.39	1815.51	436.42	1821.68	436.52	1831.48	436.73
1833.64	436.78	1835	436.8	1845.61	436.96	1854.5	437.08	1857.52	437.13
1862.45	437.2	1869.22	437.28	1873.41	437.37	1881.03	437.5	1892.91	437.6
1892.92	437.6	1892.95	437.6	1904.89	437.81	1912.41	437.9	1916.85	437.95

1923.92	438.04	1928.79	438.1	1931.9	438.17	1940.68	438.35	1951.4	438.4
1952.56	438.42	1954.42	438.44	1964.28	438.57	1970.31	438.61	1976.13	438.66
1985.38	438.75	1988.1	438.78	1989.81	438.81	2000.06	438.94	2009.31	439.06
2012.03	439.09	2016.35	439.11	2023.95	439.16	2028.8	439.21	2035.84	439.34
2046.85	439.53	2047.74	439.54	2048.3	439.55	2059.49	439.81	2067.21	439.95
2071.31	439.98	2077.82	440.09	2083.24	440.19	2086.71	440.25	2095.13	440.39
2106.21	440.59	2107.03	440.61	2108.32	440.67	2118.99	441.06	2125.7	441.4
2130.95	441.5	2139.28	441.65	2142.92	441.72	2145.2	441.76	2154.7	441.89
2164.11	442.07	2166.48	442.13	2170.25	442.26	2178.4	442.54	2183.61	442.79
2190.29	443.04	2200.75	443.27	2202.19	443.31	2203.1	443.38	2214.16	444.45
2222.6	445.58	2226.12	445.89	2231.72	446.62	2238.05	447.2	2242.1	447.27
2249.8	447.34	2261.01	447.46	2261.42	447.47				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1334.2	.013	1419	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1334.2	1419	650	507	490	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
0	1229	440

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3597

INPUT
Description: XS-3597
Station Elevation Data num= 405

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.05	6.13	435.53	12.12	435.04	22.3	432.82	28.63	431.64
38.46	430.65	45.13	429.97	54.63	430.56	61.63	430.86	70.52	431.18
77.64	431.32	86.46	431.25	94.14	431.17	102.63	431.06	110.64	430.97
118.79	431.07	127.15	431.14	134.96	431.24	143.65	431.34	150.9	431.36
159.66	431.37	166.8	431.34	176.16	431.43	182.96	431.43	192.66	431.47
199.13	431.76	209.17	432.03	215.29	432.18	225.67	432.49	231.28	432.62
241.67	432.65	247.13	432.52	258.18	432.53	263.29	432.5	274.68	432.27
279.46	432.21	291.18	432.11	295.62	432.11	307.69	432.07	311.67	432.01
323.69	431.79	327.46	431.74	340.19	431.55	343.63	431.52	356.7	431.34
359.79	431.34	373.2	431.28	375.96	431.27	389.7	431.4	392.05	431.39
405.71	431.35	407.79	431.34	422.21	431.27	423.96	431.24	438.71	431.08
440.12	431.08	455.22	430.89	456.29	430.89	471.72	430.67	472.43	430.67
487.73	430.67	488.13	430.67	504.23	430.52	504.29	430.52	507.26	430.52
520.46	430.51	520.73	430.51	536.63	430.5	537.24	430.5	552.8	430.54
553.74	430.53	568.52	430.43	569.74	430.43	584.65	430.51	586.25	430.52
600.82	430.48	602.75	430.48	616.99	430.53	619.25	430.53	633.16	430.51
635.76	430.51	648.92	430.58	651.76	430.57	665	430.65	668.26	430.66
681.17	430.76	684.77	430.8	697.34	430.91	701.27	430.96	713.51	431.1
717.77	431.17	729.33	431.29	733.78	431.35	745.36	431.41	750.28	431.42
761.53	431.45	766.78	431.46	777.7	431.58	783.29	431.6	793.87	431.7
799.79	431.79	809.73	431.92	815.8	431.96	825.72	432.1	832.3	432.23
841.89	432.37	848.8	432.46	858.06	432.58	865.31	432.68	874.23	432.88
881.81	433.07	890.14	433.34	897.81	433.42	906.08	433.45	914.32	433.5
922.25	433.47	930.82	433.52	938.42	433.44	947.32	433.39	954.58	433.36
963.83	433.31	970.55	433.27	979.83	433.2	986.43	433.15	996.33	433.08
1002.6	433.05	1012.84	433.02	1018.77	433.03	1029.34	433.02	1034.94	433.03
1045.84	432.99	1050.96	432.89	1061.85	432.73	1066.79	432.66	1078.35	432.54
1082.96	432.55	1094.85	432.56	1099.13	432.56	1111.36	432.58	1115.3	432.51
1127.86	432.44	1131.36	432.46	1143.87	432.4	1147.15	432.4	1160.37	432.39
1163.32	432.38	1176.87	432.35	1179.49	432.35	1193.38	432.34	1195.66	432.35
1209.88	432.6	1211.77	432.61	1225.88	432.74	1227.51	432.74	1242.39	432.72
1243.68	432.7	1258.89	432.78	1259.84	432.77	1275.39	432.94	1276.01	432.94
1306.07	432.53	1307.86	432.51	1307.9	432.5	1324.03	432.6	1324.4	432.57
1340.2	432.67	1340.91	432.68	1356.37	432.85	1357.41	432.85	1372.54	432.64
1373.91	432.63	1388.27	432.57	1397.73	432.59	1413	427.5	1463	427.5
1483.61	434.37	1502.16	433.84	1503.02	433.83	1504.92	433.79	1519.28	433.9
1521.42	433.92	1535.54	434.54	1537.92	434.63	1551.38	434.57	1553.93	434.56
1567.56	434.18	1570.43	434.09	1583.82	434.09	1586.93	434.1	1600.07	434.36
1603.43	434.44	1616.33	434.54	1619.93	434.57	1632.21	434.35	1635.94	434.33
1648.35	434.39	1651.86	434.41	1652.55	434.42	1661.2	434.64	1672.3	434.73
1673.12	434.72	1674.35	434.72	1684.96	434.67	1692.05	434.66	1696.8	434.57
1703.92	434.42	1708.67	434.31	1711.8	434.25	1720.42	434.25	1730.96	434.29
1732.14	434.31	1733.93	434.32	1743.99	434.39	1750.71	434.53	1755.83	434.63
1763.5	434.73	1767.7	434.8	1770.46	434.85	1779.61	434.84	1790.21	434.78
1791.52	434.77	1793.51	434.76	1803.44	434.71	1809.96	434.67	1815.25	434.76
1823.53	434.87	1826.92	434.92	1829.12	434.93	1838.72	435.02	1848.87	435.12
1850.56	435.1	1853.09	435.07	1862.46	434.95	1868.62	434.9	1874.37	434.83
1883.11	434.71	1886.26	434.67	1888.37	434.65	1898.11	434.61	1908.12	434.55

1909.91	434.55	1912.68	434.57	1921.59	434.61	1927.28	434.65	1933.39	434.72
1942.69	434.81	1945.31	434.83	1947.03	434.85	1957.22	434.88	1966.78	434.9
1969.13	434.91	1972.71	434.9	1981	434.89	1986.53	434.89	1992.84	434.88
2002.27	434.87	2004.69	434.86	2006.28	434.86	2016.41	434.89	2025.44	434.86
2028.16	434.85	2032.29	434.83	2040.02	434.78	2045.19	434.75	2051.86	434.71
2061.85	434.68	2063.71	434.68	2064.94	434.67	2075.63	434.65	2084.69	434.62
2087.54	434.62	2091.87	434.6	2099.45	434.58	2104.44	434.53	2111.24	434.54
2121.89	434.52	2122.92	434.52	2123.59	434.51	2134.75	434.5	2143.35	434.43
2146.59	434.42	2151.45	434.47	2158.48	434.55	2163.1	434.55	2170.39	434.55
2181.47	434.64	2182.3	434.65	2182.85	434.65	2194.14	435.03	2202.6	434.89
2205.91	434.74	2211.03	434.85	2217.58	434.83	2221.75	434.88	2229.41	434.66
2241.05	434.54	2241.32	434.53	2241.5	434.52	2253.24	433.77	2261.26	432.99
2265.15	432.78	2271.07	432.43	2277.03	432.11	2281.01	431.99	2288.87	431.79
2300.63	431.53	2300.71	431.53	2300.76	431.53	2312.4	431.59	2319.91	431.32
2324.17	431.36	2330.65	431.32	2336.05	431.71	2339.66	431.85	2347.89	432.05
2359.42	432.97	2359.73	432.99	2360.21	433.02	2371.64	433.41	2379.17	433.94
2383.56	434.05	2390.23	434.18	2395.47	434.01	2398.92	434.12	2407.23	434.33
2418.07	434.78	2418.93	434.83	2420.25	434.88	2430.78	434.97	2437.82	435.14
2442.62	435.22	2449.81	435.43	2454.49	435.52	2457.57	435.63	2466.41	435.74
2477.33	435.98	2478.32	435.95	2479.83	435.9	2490.17	435.42	2497.08	435.28
2501.92	435.27	2509.39	435.21	2513.57	435.16	2516.23	435.14	2525.43	435.16
2535.98	435.19	2537.34	435.18	2539.41	435.18	2549.26	435.19	2555.73	435.17
2561.17	435.19	2569.43	435.15	2573.06	435.15	2575.49	435.15	2584.9	435.37
2595.24	435.58	2596.71	435.6	2598.99	435.66	2608.39	435.93	2614.39	435.97
2620.19	435.98	2629.01	436.09	2632.09	436.13	2634.14	436.16	2643.93	436.19
2653.89	436.19	2655.77	436.2	2658.57	436.21	2667.66	436.21	2673.65	436.27
2679.57	436.36	2688.59	436.46	2691.49	436.49	2693.4	436.54	2703.21	436.89
2712.55	437.03	2714.95	437.11	2718.6	437.24	2726.81	437.6	2732.3	437.71
2738.66	437.86	2748.17	438.29	2750.51	438.4	2752.05	438.44	2762.42	438.55
2771.8	438.75	2774.34	438.78	2778.18	438.84	2786.2	438.89	2791.56	438.95
2797.92	439.02	2807.75	439.11	2809.56	439.14	2810.71	439.17	2821.45	439.34
2830.46	439.6	2833.36	439.69	2837.77	439.74	2845.27	439.85	2850.21	439.93
2857.19	440.1	2867.78	440.27	2869.09	440.3	2869.96	440.32	2875.28	440.48

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1397.73	.013	1483.61	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1397.73	1483.61	510	499	584	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1356	432.9	1484	2875.28	434.8

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 3098

INPUT
Description: XS-3098
Station Elevation Data num= 426

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.2	1.24	436.13	14.84	434.22	17.24	433.89	31.14	431.7
33.74	431.33	47.51	429.83	50.24	429.45	63.89	430.18	66.74	430.35
80.26	430.92	83.24	431.05	96.23	431.18	99.24	431.22	112.51	430.73
115.74	430.64	128.88	430.51	132.24	430.46	145.26	430.79	148.74	430.87
165.24	431.1	177.62	431.14	181.24	431.14	193.88	431.19	197.74	431.2
210.25	431.27	226.63	431.39	230.74	431.43	243	431.49	247.24	431.56
259.01	431.53	263.24	431.51	275.25	431.39	279.74	431.31	291.62	431.34
308	431.42	312.74	431.43	324.37	431.36	329.24	431.34	345.25	431.24
372.99	430.99	378.25	430.92	394.75	431.01	405.74	431.14	411.25	431.23
421.79	431.33	427.25	431.35	437.99	431.34	443.75	431.37	454.36	431.51
460.25	431.56	487.11	431.54	493.25	431.52	503.17	431.64	509.25	431.74
525.75	431.76	542.25	431.89	552.11	431.88	558.75	431.91	568.48	431.99
575.25	432.07	584.56	432.12	591.25	432.17	607.75	432.02	617.1	432.05
624.25	432.03	640.75	432.15	657.25	432.14	665.95	432.11	673.26	432.11
682.1	432.09	689.76	432.05	698.47	432.17	706.26	432.31	714.85	432.39
722.76	432.41	739.26	432.4	755.26	432.36	771.76	432.49	779.84	432.5
788.26	432.49	796.22	432.56	804.76	432.57	812.59	432.65	821.26	432.83
837.26	432.7	844.84	432.66	853.76	432.54	861.21	432.48	870.26	432.53
886.76	432.45	893.96	432.45	903.26	432.4	910.12	432.46	919.26	432.52
926.21	432.55	942.58	432.52	952.26	432.54	958.96	432.53	975.33	432.44
985.26	432.43	991.51	432.46	1001.27	432.47	1007.58	432.52	1017.77	432.56
1023.95	432.56	1040.33	432.63	1050.77	432.76	1056.66	432.94	1059.61	433.39
1072.96	434.33	1080.36	434.32	1102.72	435.18	1109.42	435.54	1137.67	435.54
1143.71	435.47	1238.36	434.69	1261.77	434.41	1334.36	433.31	1336.06	433.21
1339.39	433.02	1345.78	433.39	1355	433	1383.82	431.98	1395.9	427.95
1401.24	426.24	1405.69	426.25	1451	426.25	1473.14	433.63	1477.28	433.77
1481.4	433.77	1491.62	433.83	1493.44	433.85	1496.12	433.83	1508.59	433.63

1521.06	433.5	1529.67	433.53	1533.52	433.64	1545.97	433.82	1547.79	433.85
1565.9	434.01	1581.38	433.82	1582.83	433.8	1583.47	433.79	1595.28	433.72
1601.59	433.67	1607.75	433.78	1619.7	433.95	1620.21	433.95	1637.82	434.12
1645.03	434.1	1655.93	434.11	1660.71	434.08	1669.6	434.01	1673.5	433.97
1691.62	434.33	1706.91	434.28	1709.73	434.3	1727.85	433.99	1731.84	434.01
1740.64	433.89	1744.29	433.88	1745.96	433.86	1756.47	434.13	1763.53	434.13
1768.72	434.23	1780.01	434.69	1781.14	434.73	1781.65	434.74	1793.6	434.85
1799.76	434.98	1806.07	434.94	1830.95	434.91	1835.99	434.93	1843.2	434.93
1853.56	434.97	1855.38	434.97	1859.34	434.95	1867.83	434.88	1871.68	434.88
1892.76	434.8	1899.31	434.84	1905.22	434.86	1907.91	434.86	1917.69	434.91
1926.02	435.01	1930.07	435.03	1939.27	435.05	1954.64	435.06	1961.71	435.04
1967.04	435.07	1979.82	435.07	1991.92	435.03	1997.94	435.06	2004.38	435.06
2016.05	434.89	2016.83	434.89	2018.6	434.9	2033.62	435.02	2041.29	434.96
2051.74	434.84	2066.15	434.7	2078.61	434.5	2087.97	434.32	2091.08	434.28
2097.94	434.25	2103.54	434.21	2106.08	434.21	2115.8	434.27	2123.65	434.28
2128.1	434.35	2140.55	434.49	2141.77	434.51	2152.96	434.65	2159.88	434.68
2177.27	434.84	2177.77	434.85	2178	434.85	2196.11	435.05	2202.56	435.09
2213.68	435.13	2227.21	435.12	2231.8	434.94	2239.61	434.9	2249.91	435.05
2252.02	435.04	2264.46	435.59	2268.03	435.65	2286.14	435.6	2289.33	435.56
2296.56	435.52	2301.53	435.46	2303.71	435.46	2313.95	435.42	2321.83	435.49
2326.41	435.5	2338.87	435.33	2339.94	435.33	2351.27	435.4	2358.06	435.37
2363.68	435.44	2375.9	435.51	2376.17	435.51	2388.29	435.55	2393.74	435.58
2411.86	435.44	2413.11	435.41	2415.86	435.37	2429.97	435.11	2437.93	435.05
2448.09	435.15	2450.34	435.16	2455.23	435.17	2466.2	435.21	2487.33	435.38
2512.26	435.47	2520	435.44	2524.73	435.43	2535.16	435.35	2537.19	435.34
2538.12	435.34	2549.59	435.5	2556.23	435.62	2573.8	435.73	2574.03	435.73
2574.52	435.72	2586.49	435.61	2591.92	435.58	2598.96	435.6	2614.49	435.6
2623.84	435.58	2628.15	435.62	2636.25	435.81	2646.26	435.91	2648.61	435.9
2653.85	435.96	2660.78	436.02	2663.83	436.06	2673.18	436.04	2681.95	435.98
2685.65	435.97	2698.12	435.9	2700.06	435.88	2710.58	435.85	2718.18	435.85
2723.05	435.81	2733.79	435.76	2735.5	435.75	2736.29	435.74	2747.67	435.54
2753.86	435.48	2759.94	435.38	2771.98	435.29	2773.15	435.29	2784.81	435.18
2797.27	435.04	2808.21	434.89	2809.74	434.88	2813.12	434.89	2826.32	434.9
2834.4	434.93	2843.89	434.94	2846.6	434.93	2852.48	434.96	2859.04	434.98
2862.01	434.97	2871.5	434.96	2880.12	434.98	2892.45	435.04	2896.43	435.05
2898.24	435.07	2916.35	434.77	2921.26	434.68	2932.42	434.52	2933.46	434.51
2933.92	434.5	2952.04	434.55	2958.26	434.65	2970.15	434.77	2970.67	434.78
2971.78	434.79	2983.13	434.92	2988.27	434.96	3006.38	435.2	3008.02	435.23
3020.19	435.49	3023.95	435.6	3032.51	435.77	3042.07	436	3057.35	436.25
3060.18	436.29	3069.82	436.4	3078.3	436.52	3082.28	436.55	3094.75	436.71
3096.41	436.72	3106.99	436.82	3113.98	436.87	3119.3	436.95	3131.05	437.16
3131.77	437.17	3132.1	437.17	3144.17	437.48	3156.58	437.82	3168.98	438.19
3170.41	438.23	3181.44	438.58	3186.44	438.69	3204.01	438.93	3206	438.94
3218.42	439.05	3222.13	439.04	3230.83	438.94	3240.24	438.92	3243.24	438.88
3255.67	438.66	3258.36	438.62	3268.14	438.74	3276.47	438.63	3280.52	438.6
3292.72	438.53	3294.04	438.5	3305.16	438.37	3317.62	438.27	3329.68	438.43
3330.09	438.44	3330.27	438.44	3342.49	438.29	3348.39	438.29	3354.9	438.2
3366.5	438.23	3367.29	438.22	3369.04	438.21	3379.48	438.13	3384.07	438.13
3391.85	438.2	3402.19	438.16	3404.31	438.16	3409.01	438.05	3416.74	437.93
3420.3	437.54	3429.15	436.75	3438.42	436.43	3441.55	436.19	3448.37	436.12
3453.99	436.01	3456.53	435.89	3466.25	435.51	3474.1	435.3	3478.54	435.31
3488.34	435.44	3491.01	435.47	3492.22	435.49	3503.47	435.78	3510.33	435.97
3528.31	436.64	3528.45	436.65	3546.56	437.43	3553.08	437.7	3564.13	438.28
3565.25	438.32	3577.7	438.98	3582.25	439.5	3590.17	440.53	3600.36	442.08
3602.63	442.5	3607.64	443.56	3615.06	445.11	3618.48	446.45	3627.47	450.49
3636.59	453.78	3639.81	454.45	3647	456.64	3651.97	458.03	3654.16	458.45
3664.39	460.21	3672.28	461.27	3676.86	462	3686.97	464.12	3689.32	464.59
3689.76	464.7	3694.09	466.39	3696.83	466.8	3697.34	466.76	3697.71	466.72
3698.35	466.71								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1383.82	.013	1473.14	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1383.82	1473.14	690	501	980	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1102	435	1474	3698.35	433.7

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2597

INPUT
Description:
Station Elevation Data num= 465

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.14	14.23	434.39	20.54	433.81	40.1	432.6	41.54	432.48

46.53	432.01	62.22	430.48	66.77	430.13	83.22	430.09	93.45	430.04
103.9	430.21	120.12	430.24	124.9	430.22	145.9	430.39	146.8	430.4
166.58	430.56	172.66	430.62	187.58	430.95	191.94	431.07	196.52	431.22
200.27	431.29	213.03	431.64	217.35	431.7	229.54	431.98	234.43	432.1
246.05	432.16	251.33	432.15	262.05	432.25	268.06	432.32	278.56	432.34
295.07	432.13	302.22	432.09	311.58	432.22	319.29	432.26	328.09	432.17
336.11	432.21	352.93	432.19	360.61	432.2	377.12	432.35	404.16	432.44
410.13	432.41	420.89	432.54	426.14	432.53	437.8	432.46	442.65	432.49
454.88	432.4	471.95	432.36	475.67	432.38	489.03	432.4	492.18	432.4
505.67	432.54	508.19	432.55	522.67	432.59	524.69	432.6	539.74	432.79
541.2	432.8	556.82	433.16	557.71	433.17	573.9	433.06	574.22	433.06
590.23	433.21	590.45	433.21	606.74	433.52	607.52	433.52	623.25	433.44
624.59	433.45	639.76	433.3	641.66	433.32	656.27	433.55	658.65	433.55
672.27	433.68	675.28	433.65	688.78	433.38	709.41	433.26	721.8	433.37
726.48	433.36	743.39	433.22	754.32	433.11	760.1	433.13	770.83	433.15
777.17	433.14	787.34	433.18	794.24	433.18	803.84	433.26	811.3	433.23
836.36	433.07	844.92	432.99	852.87	432.94	869.38	432.77	879.06	432.77
885.89	432.74	896.13	432.79	902.4	432.7	912.86	432.85	918.41	433.03
929.75	432.99	934.91	432.98	946.81	432.93	951.42	432.96	963.88	432.89
980.95	432.72	984.44	432.7	997.59	432.65	1000.45	432.65	1014.57	432.73
1016.96	432.72	1031.64	432.6	1048.71	432.5	1049.98	432.49	1065.77	432.58
1066.49	432.58	1082.33	432.7	1082.49	432.71	1099	432.64	1099.39	432.64
1115.51	432.46	1116.46	432.47	1132.02	432.76	1133.53	432.77	1148.53	432.85
1150.53	432.85	1164.54	432.87	1167.15	432.91	1181.05	433.01	1184.22	433.05
1197.56	433.42	1230.57	433.74	1246.58	433.93	1251.97	433.97	1263.09	434.1
1269.04	434.21	1279.6	434.32	1286.11	434.2	1296.11	434.13	1303.18	433.99
1312.62	433.9	1328.63	433.95	1345.14	434.16	1353.86	434.38	1370.93	434.51
1378.15	434.58	1388	434.48	1394.66	434.39	1404.74	434.4	1410.67	434.47
1421.62	433.65	1434	433.09	1438.49	432.17	1460	425	1510	425
1532.37	432.46	1533	432.48	1542.23	432.61	1557.18	432.77	1558.74	432.79
1573.54	432.65	1574.74	432.64	1590.23	432.57	1591.24	432.56	1606.95	432.63
1607.74	432.63	1623.67	432.72	1624.24	432.72	1640.39	432.83	1640.74	432.83
1656.62	432.85	1673.25	432.83	1673.34	432.83	1689.75	432.9	1690.06	432.9
1706.25	432.95	1706.79	432.95	1722.75	432.82	1723.49	432.82	1738.75	432.8
1739.73	432.79	1755.25	432.7	1756.46	432.7	1771.76	432.6	1773.19	432.57
1788.26	432.49	1795.72	432.49	1800.41	432.5	1804.02	432.5	1805.42	432.51
1816.51	432.57	1829.11	432.67	1841.85	432.74	1845.82	432.77	1854.59	432.86
1858.02	432.86	1875.73	432.94	1880.08	432.99	1891.22	433.1	1892.81	433.12
1893.44	433.12	1905.23	433.26	1910.61	433.3	1917.8	433.33	1928.32	433.31
1930.48	433.3	1943.2	433.3	1955.94	433.44	1963.75	433.46	1981.34	433.3
1981.46	433.3	1993.83	433.24	2016.34	433.36	2019.1	433.36	2026.05	433.57
2031.81	433.68	2034.05	433.74	2044.55	433.95	2051.76	434.13	2057.29	434.18
2069.48	434.31	2070.02	434.29	2071.46	434.24	2082.48	433.77	2086.65	433.63
2095.13	433.46	2104.36	433.07	2107.87	432.98	2120.59	432.97	2122.07	432.96
2123.93	432.9	2125.4	432.88	2168.32	431.7	2181.53	431.68	2197.44	431.53
2246.91	431.46	2297.1	431.03	2297.82	431.01	2298.11	431.01	2310.56	431.12
2315.82	431.18	2323.31	431.12	2333.53	431.18	2335.99	431.16	2342.5	431.21
2348.43	431.22	2350.7	431.21	2361.06	431.14	2373.75	431.15	2386.12	431.12
2387.22	431.12	2399.17	431.08	2403.84	431.01	2411.91	430.99	2421.55	431.1
2424.59	431.11	2432.62	431.25	2437.03	431.32	2438.72	431.3	2449.68	431.71
2456.43	431.73	2462.26	431.67	2487.78	430.84	2491.85	430.94	2500.52	431.03
2509.56	430.99	2513.18	430.95	2522.74	430.8	2525.64	430.76	2526.74	430.75
2538.36	430.5	2544.45	430.45	2562.16	430.4	2563.84	430.4	2568.14	430.42
2576.54	430.43	2589.23	430.58	2601.82	430.63	2614.76	430.62	2626.96	430.68
2632.47	430.77	2639.71	430.84	2650.18	430.92	2652.45	430.95	2658.26	431.07
2665.16	431.18	2667.89	431.21	2677.84	431.27	2685.6	431.34	2690.42	431.37
2702.77	431.56	2702.98	431.56	2728.31	431.68	2748.38	431.62	2755.91	431.62
2773.62	431.65	2779.15	431.67	2790.79	431.68	2791.63	431.69	2793.78	431.7
2808.5	431.82	2817.01	431.87	2826.21	431.88	2829.7	431.89	2842.4	431.86
2843.92	431.87	2861.64	431.93	2867.75	431.99	2880.24	432.25	2892.94	432.4
2896.52	432.45	2918.31	432.49	2928.62	432.56	2931.01	432.58	2931.94	432.59
2943.75	432.67	2966.83	432.75	2968.85	432.79	2974.02	432.84	2981.59	432.95
2984.54	432.95	2994.33	432.97	3002.25	432.96	3007.07	432.99	3019.43	432.94
3019.96	432.94	3032.5	432.91	3037.67	432.91	3045.02	432.69	3054.85	432.45
3057.48	432.39	3064.14	432.19	3070.2	432.03	3078.01	431.98	3096.66	432.03
3106.98	432.18	3107.98	432.19	3121.11	432.19	3125.69	432.07	3133.62	431.92
3142.86	431.98	3146.1	432.06	3154.26	431.96	3158.8	431.92	3160.57	431.93
3171.54	431.96	3178.29	432.09	3184.28	431.96	3196	431.8	3199.66	431.69
3209.77	431.41	3213.71	431.33	3222.31	431.27	3230.88	430.99	3234.86	431.02
3245.07	431	3247.59	431.02	3248.59	431	3260.28	431.35	3266.3	431.33
3272.96	431.35	3284.01	431.64	3285.65	431.68	3289.78	431.81	3298.37	432.02
3301.72	432.12	3310.91	432.12	3318.9	432.24	3323.47	432.22	3335.19	432.31
3336.21	432.32	3337.54	432.32	3372.03	432.35	3374.26	432.34	3379.9	432.3
3386.98	432.23	3389.74	432.22	3399.5	432.15	3406.92	432.12	3412.08	432.08
3424.63	431.93	3424.82	431.93	3425.3	431.92	3442.34	431.81	3450.3	431.78
3460.05	431.77	3463.04	431.76	3488.21	432.14	3494.93	432.25	3500.75	432.27
3512.64	432.24	3513.43	432.24	3515.42	432.27	3526.16	432.39	3530.35	432.46
3538.91	432.64	3548.07	432.73	3556.99	432.78	3560.83	432.81	3638.52	433.16
3640.25	433.16	3650.94	433.18	3652.99	433.19	3665.47	433.19	3670.97	433.22
3688.68	433.2	3690.83	433.21	3703.54	433.38	3706.39	433.43	3716.23	433.67
3724.1	433.79	3741.06	434.01	3741.81	434.01	3758.99	434.14	3766.7	434.17

3776.7	434.3	3786.47	434.48	3792.16	434.56	3794.41	434.57	3804.84	434.72
3812.12	434.67	3817.53	434.57	3830.21	434.56	3831.18	434.57	3842.66	434.63
3855.31	434.71	3864.71	434.74	3868.05	434.71	3876.59	434.41	3880.79	434.29
3882.43	434.19	3893.53	433.42	3900.14	432.95	3906.27	432.72	3917.85	432.66
3918.98	432.71	3921.99	432.99	3931.41	433.94	3935.02	434.24	3944.01	434.97
3952.73	435.27	3956.7	435.38	3966.71	436.05	3969.39	436.2	3970.44	436.29
3982.14	436.81	3988.15	437.36	3994.88	438.09	4005.87	439.54	4007.58	439.88
4012.11	440.56	4020.01	441.91	4023.04	442.56	4032.62	444.75	4040.75	446.25
4045.31	446.94	4056.82	448.58	4058	448.75	4058.46	448.81	4076.17	453.01
4093.88	455.59	4096.17	456	4111.06	458.83	4121.32	460.43	4128.77	461.29
4134.06	462.15	4146.48	463.12	4146.8	463.16	4147.63	463.04	4154.29	461.97

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1434	.013	1532.37	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1434	1532.37	760	500	410	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1370	434.5	2069	4154.29	434.3

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 2097

INPUT
Description: XS-2097
Station Elevation Data num= 441

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.08	8.65	435.23	17.96	434.13	25.15	432.93	34.18	431.92
41.65	430.74	50.14	430.13	57.66	429.98	66.13	430.05	74.16	430.38
82.36	430.39	90.66	430.57	123.67	430.48	130.81	430.64	139.67	431.04
146.76	431.27	156.17	431.65	162.98	431.74	172.67	431.83	179.2	432.02
189.18	432.13	195.43	432.42	205.68	432.92	211.47	433.17	221.68	433.58
238.18	433.96	243.6	434.03	254.68	434.11	266.15	434.14	276.05	434.37
287.69	434.39	292.14	434.24	303.69	434.21	308.01	434.18	320.19	434.23
324.23	434.21	336.7	434.17	340.45	434.18	353.2	434.24	356.68	434.24
372.8	434.13	385.7	434.12	388.63	434.1	402.21	434.06	421.08	434.19
437.3	434.29	451.71	434.4	453.47	434.4	484.22	434.59	517.92	434.59
533.72	434.65	549.73	434.67	599.23	434.65	630.56	434.71	648.24	434.71
664.74	434.93	679.2	435.01	681.25	435.03	695.43	434.85	697.75	434.83
713.75	434.55	727.39	434.58	730.25	434.57	746.76	434.62	763.26	434.55
776.08	434.43	779.76	434.41	791.93	434.37	795.76	434.35	812.26	434.34
824.27	434.48	828.77	434.54	840.49	434.6	845.27	434.64	861.77	434.69
872.62	434.68	877.77	434.65	888.68	434.67	921.14	434.62	927.28	434.63
937.37	434.58	953.3	434.32	959.79	434.26	969.33	434.23	976.29	434.19
985.56	434.17	992.79	434.13	1009.29	433.83	1018.01	433.69	1033.99	433.51
1041.8	433.52	1049.97	433.5	1074.8	433.18	1082.43	433.2	1091.3	433.18
1107.81	433.26	1114.67	433.27	1123.81	433.23	1130.62	433.24	1140.31	433.17
1146.85	433.14	1156.81	433.02	1163.07	432.99	1173.32	433.06	1179.3	433.13
1189.82	433.29	1195.36	433.36	1205.82	433.52	1211.26	433.57	1222.32	433.69
1227.49	433.76	1238.83	433.94	1243.72	433.97	1255.33	434.09	1259.95	434.09
1276.04	434.05	1287.83	434.08	1291.91	434.14	1304.34	434.28	1320.84	434.37
1324.36	434.36	1337.34	434.22	1340.59	434.15	1353.84	433.72	1369.84	433.17
1372.55	433.11	1386.35	432.92	1405.01	432.82	1419.35	432.78	1421.23	432.73
1437.41	432.24	1451.86	431.85	1453.2	431.83	1456	430.99	1478.79	430.82
1500	423.75	1500.08	423.75	1550	423.75	1574.63	431.96	1577.51	432.04
1578.18	432.09	1602.8	432.42	1614.27	432.5	1617.74	432.51	1631.67	432.5
1640.07	432.41	1652.64	432.45	1665.24	432.41	1678.22	432.41	1684.85	432.37
1691.2	432.36	1702.25	432.42	1704.14	432.42	1719.13	432.6	1729.83	432.71
1736.53	432.64	1742.86	432.52	1753.94	432.33	1755.89	432.31	1761.69	432.33
1768.92	432.34	1771.34	432.33	1781.95	432.23	1788.75	432.23	1794.84	432.26
1805.63	432.27	1823.03	432.1	1833.6	432.04	1840.44	431.96	1846.58	431.92
1857.84	431.96	1864.6	432.05	1875.25	432.24	1885.36	432.29	1892.12	432.24
1898.24	432.25	1909.53	432.32	1911.27	432.41	1916.45	432.49	1926.93	432.71
1937.25	433.05	1944.34	433.1	1950.23	432.9	1961.74	432.76	1967.51	432.65
1975.89	432.47	1978.62	432.46	1988.86	432.46	1996.03	432.4	2001.89	432.4
2013.43	432.38	2027.95	432.17	2030.83	432.15	2040.98	432.28	2048.24	432.31
2053.88	432.27	2065.12	432.26	2071.2	432.21	2079.64	432.12	2082.52	432.12
2092.62	432	2099.93	431.85	2105.6	431.66	2117.33	431.08	2118.59	431.06
2131.6	431.09	2134.74	431.09	2151.61	431.22	2157.27	431.3	2169.02	431.39
2170.3	431.41	2183.29	431.48	2203.83	431.48	2209.26	431.44	2221.23	431.39
2234.93	431.35	2238.11	431.35	2272.92	431.29	2290.33	431.24	2300.01	431.24
2307.73	431.2	2312.92	431.19	2324.61	431.24	2338.67	431.14	2351.65	431.08
2359.42	431.02	2364.63	431.01	2376.82	431.03	2390.63	431.11	2403.45	431.27
2416.3	431.32	2429.33	431.4	2442.32	431.3	2445.92	431.29	2463.32	431.27
2468.28	431.29	2481.25	431.28	2493.98	431.32	2497.6	431.38	2506.92	431.46
2532.41	431.58	2532.98	431.59	2546.01	431.6	2549.82	431.61	2559.04	431.67

2567.22	431.68	2584.1	431.75	2597.7	431.75	2601.5	431.71	2610.68	431.46
2636.31	431.28	2649.67	431.26	2653.72	431.29	2661.5	431.41	2685.2	431.52
2688.36	431.56	2701.35	431.89	2705.41	431.85	2714.33	431.71	2722.81	431.83
2727.31	431.82	2740.5	431.91	2765.95	431.73	2774.5	431.71	2791.68	431.79
2805.05	431.87	2817.88	431.75	2826.71	431.75	2831.01	431.74	2844.19	431.84
2861	431.92	2869.7	431.73	2895.81	431.69	2908.7	431.86	2913.21	431.93
2934.36	432.32	2947.1	432.44	2964.9	432.41	2973.35	432.38	2982.3	432.33
2999.71	432.13	3002.73	432.13	3025.99	432.1	3040.42	432.02	3050.01	432.11
3051.4	432.11	3064.08	431.77	3068.8	431.82	3077.11	431.96	3086.21	431.95
3101.85	432.01	3115.75	431.97	3120.49	432.02	3137.89	432.05	3152.91	430.66
3155.3	430.43	3172.7	430.43	3180.58	430.69	3189.58	430.88	3193.4	430.93
3206.99	431.26	3219.4	431.52	3224.39	431.57	3232.38	431.58	3245.36	431.53
3258.35	431.54	3259.2	431.53	3271.1	431.5	3276.08	431.48	3284.02	431.39
3307.67	431.48	3310.89	431.48	3323.11	431.45	3336.14	431.39	3345.7	431.28
3349.09	431.25	3359.52	431.3	3364.16	431.28	3379.98	431.17	3397.38	430.98
3400.74	430.92	3410.58	430.82	3414.79	430.8	3426.76	430.72	3432.19	430.6
3439.62	430.53	3449.07	430.59	3452.43	430.69	3462.42	430.63	3466.48	430.66
3478.43	430.83	3483.88	430.87	3504.39	431.13	3517.38	431.23	3518.69	431.26
3530.15	431.4	3535.57	431.45	3543.05	431.38	3552.97	431.33	3556.08	431.33
3565.33	431.26	3570.38	431.24	3587.78	431.26	3595.17	431.23	3605.19	431.23
3608.13	431.26	3620.85	431.3	3633.8	431.28	3639.47	431.35	3646.78	431.46
3656.88	431.47	3659.77	431.49	3674.28	431.5	3685.79	431.44	3698.66	431.31
3720.09	431.29	3725.97	431.3	3737.45	431.38	3743.37	431.38	3750.43	431.42
3760.78	431.43	3763.41	431.42	3776.41	431.48	3789.19	431.32	3812.46	431.12
3815.11	431.12	3847.27	431.25	3864.68	431.22	3879.89	431.14	3892.83	431.14
3898.96	431.2	3905.81	431.22	3918.79	431.23	3931.79	431.13	3933.77	431.1
3944.82	431.11	3951.18	431.14	3957.7	431.14	3968.05	431.18	3970.49	431.17
3983.5	431.16	3985.46	431.14	4020.27	431.04	4035.45	430.99	4037.67	430.97
4048.23	430.8	4061.11	430.73	4071.96	430.64	4074.14	430.63	4087.17	430.52
4089.36	430.48	4100.2	430.23	4106.77	430.2	4113.23	430.07	4124.17	430.96
4126.22	431.15	4132.5	431.34	4138.93	431.56	4141.05	431.73	4151.86	432.87
4158.45	433.11	4164.84	433.31	4177.82	433.54	4183.56	433.59	4193.26	433.69
4203.86	433.84	4210.67	433.96	4216.74	434.09	4229.52	434.39	4242.52	434.61
4244.95	434.69	4255.51	435.1	4262.35	435.52	4276.29	436.85	4279.76	437.1
4281.47	437.32	4286.47	438.22	4294.48	439.63	4297.16	440.18	4307.27	443
4314.04	444.8	4320.14	446.35	4331.45	449.13	4333.17	449.47	4346.2	452.36
4348.85	453.01	4359.23	455.1	4366.26	456.5	4372.27	457.89	4383.66	461
4385.26	461.53	4390.16	462.71	4397.96	464.72	4400.54	465.02	4410.88	465.76
4417.94	465.67	4423.86	465.02	4435.35	463.54	4436.84	463.33	4443.7	462.73
4444.4	462.77								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1478.79	.013	1574.63	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1478.79	1574.63	460	497	900	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1320	434.4	1944	4444.4	433.1

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1600

INPUT
Description:
Station Elevation Data num= 441

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.32	2.04	436.18	18.54	433.35	26.39	431.64	35.04	429.99
51.54	427.75	59.58	428.01	68.04	428.15	75.93	428.7	84.04	429.35
92.27	429.5	100.54	429.61	117.04	429.58	133.54	429.8	142.06	430.15
150.04	430.41	158.39	431.02	166.04	431.61	174.75	432.16	182.54	432.52
191.35	432.77	199.04	433.2	215.54	433.45	224.54	433.45	240.86	433.63
248.04	433.66	257.23	433.62	264.54	433.72	273.83	433.74	281.04	433.7
290.43	433.72	297.54	433.8	307.02	433.81	323.33	433.76	330.04	433.78
339.71	433.88	346.54	433.87	356.31	433.76	363.04	433.72	372.91	433.72
379.54	433.69	389.5	433.67	396.04	433.6	405.79	433.55	412.04	433.57
428.54	433.36	438.79	433.2	445.04	433.08	455.39	433.08	461.54	433.05
471.99	432.89	478.04	432.82	494.04	432.58	510.54	432.5	521.27	432.54
527.04	432.61	543.55	433.17	554.47	433.26	560.05	433.28	570.73	433.43
576.05	433.54	587.16	433.46	592.55	433.36	609.05	433.23	620.35	433.02
625.55	432.88	636.95	432.73	653.19	432.65	658.05	432.64	669.64	432.53
686.24	432.28	691.05	432.19	702.83	432.1	707.55	432.11	719.43	432.35
724.05	432.42	735.66	432.71	740.05	432.78	752.12	432.88	756.55	432.9
773.05	433.03	785.31	433.1	789.55	433.16	806.05	433.36	822.05	433.52
834.6	433.66	838.55	433.69	855.05	433.72	871.55	433.51	888.05	432.95
900.6	432.46	904.05	432.34	917.08	432.38	920.55	432.38	933.68	432.8
937.05	432.89	953.55	433.06	970.05	433.14	983.06	433.35	986.05	433.38

1002.55	433.62	1016.16	433.97	1019.05	434.02	1032.76	434.17	1035.55	434.22
1052.05	434.37	1068.05	434.41	1082.05	434.62	1101.05	434.99	1117.55	435.43
1131.84	435.66	1150.06	436.07	1166.56	436.22	1181.12	436.32	1183.06	436.35
1197.72	436.44	1214.32	436.56	1232.06	436.65	1249.82	436.68	1257.04	436.66
1270.87	436.66	1281.44	436.59	1287.05	436.57	1293.61	436.5	1305.99	436.44
1317.75	436.31	1323.71	436.28	1329.86	436.2	1341.65	436.16	1354.32	435.7
1360.93	435.39	1366.55	435.1	1379.54	434.22	1390.94	433.83	1398.16	433.57
1403	433.31	1412.43	432.97	1414.94	432.92	1427.14	433.02	1434.82	432.96
1439.37	432.86	1453.43	432.93	1463.75	432.67	1472.04	432.43	1475.91	432.4
1488.1	432.36	1490.65	432.37	1500.14	432.29	1508.7	432.33	1513.21	432.26
1525.28	432.14	1541.78	432.23	1546.64	432.22	1558.28	432.27	1561	432.48
1581	432.28	1596	428.55	1614	422.75	1664	422.75	1690.08	431.44
1696.86	431.4	1705.82	431.43	1713.19	431.64	1722.32	431.88	1731.63	431.57
1745.65	431.33	1764.47	431.33	1773.59	431.14	1784.61	431.08	1796.25	430.85
1804.89	430.7	1814.59	430.7	1821.26	430.8	1823.67	430.76	1830.71	430.85
1892.63	431.85	1907.82	431.88	1917.09	431.86	1930.3	431.92	1946.12	431.93
1952.96	431.97	1962.73	431.99	1985.47	432.14	1998.61	432.15	2010.7	432.17
2015.16	432.21	2036.17	432.24	2050.47	432.17	2061.74	432.25	2068.13	432.18
2073.63	432.17	2093.82	432.17	2099.83	432.13	2113.15	432.49	2121.19	432.64
2138.22	434.15	2155.87	434.61	2164.19	434.84	2173.53	435.08	2184.72	435.13
2188.83	435.26	2216.38	432.37	2263.44	432.45	2282.5	432.42	2293.34	432.43
2313.71	432.41	2331.37	432.25	2349.02	432.25	2366.15	432.02	2417.61	432.46
2419.12	432.48	2436.77	432.48	2459.36	431.97	2468.19	431.69	2471.55	431.69
2489.21	431.99	2493.76	432.04	2505.72	431.99	2506.86	432	2519.33	432.57
2524.52	432.52	2531.95	432.48	2541.64	432.52	2544.52	432.44	2552.07	432.4
2557.28	432.35	2570.01	432.33	2576.95	432.29	2594.61	432.45	2608.26	432.61
2620.85	432.63	2633.44	432.61	2647.04	432.67	2658.95	432.55	2671.68	432.55
2684.41	432.59	2697.18	432.54	2700.01	432.54	2709.74	432.49	2717.13	432.49
2722.36	432.45	2734.79	432.49	2760.72	432.46	2773.51	432.51	2787.76	432.5
2798.76	432.45	2811.36	432.45	2822.54	432.4	2836.86	432.37	2849.65	432.42
2862.43	432.45	2875.51	432.58	2887.67	432.61	2910.28	432.49	2920.11	432.4
2925.78	432.32	2927.94	432.32	2938.57	432.24	2951.35	432.2	2966.47	432.14
2976.62	432.08	2980.37	432.08	2998.03	432.14	3012.83	432.36	3027.62	432.64
3033.34	432.78	3046.78	432.62	3071.06	432.29	3103.1	432.6	3104.84	432.59
3118.47	432.26	3153.01	433.5	3154.4	433.61	3155.87	433.5	3169.84	433.33
3173.52	433.27	3187.7	432.66	3191.18	432.48	3196.85	432.51	3205.53	432.64
3208.84	432.64	3218.32	432.7	3226.49	432.77	3256.23	432.79	3261.27	432.85
3268.96	432.74	3278.93	432.77	3288.86	432.76	3294.45	432.73	3296.58	432.64
3307.24	432.53	3314.24	432.57	3319.9	432.49	3331.36	432.46	3335.21	432.47
3345.17	432.57	3349.02	432.55	3357.9	432.64	3370.63	432.66	3384.33	432.83
3396.16	432.86	3408.79	432.96	3419.11	433.96	3421.35	433.99	3427.22	435.43
3434.13	436.92	3436.76	436.92	3439.03	436.43	3442.71	436.27	3485.01	433.43
3492.47	433.07	3506.85	433.07	3524.51	432.99	3535.84	433.06	3542.17	433.03
3559.82	433.09	3565.59	432.99	3577.48	432.7	3586.69	432.51	3594.6	432.48
3599.24	432.54	3611.24	432.66	3629.91	433.02	3647.57	433.2	3650.34	433.25
3663.12	433.36	3675.67	433.34	3682.35	433.31	3688.31	433.31	3700	433.38
3717.66	433.44	3735.32	433.47	3739.3	433.5	3752.97	433.54	3764.57	433.5
3770.09	433.54	3777.23	433.55	3790.02	433.43	3795.96	433.43	3805.41	433.39
3823.06	433.33	3828.24	433.39	3841.62	433.35	3853.46	433.41	3857.84	433.41
3875.5	433.24	3887.97	433.26	3904.51	433.3	3917.3	433.38	3928.47	433.4
3934.33	433.35	3945.59	433.22	3955.18	433.03	3963.24	432.94	3980.9	432.88
3993.43	432.93	4006.22	433.03	4026.34	433.1	4031.43	433.11	4044.11	433.22
4056.85	433.25	4068.65	433.24	4082.35	433.14	4086.3	433.13	4103.96	433.24
4121.08	433.3	4133.11	433.31	4158.68	433.12	4171.44	433.08	4174.05	433.06
4184.17	433.1	4191.71	433.16	4196.79	433.22	4208.83	433.33	4222.03	433.4
4226.48	433.38	4234.82	433.44	4247.61	433.38	4261.79	433.35	4273.11	433.18
4279.45	433.12	4285.7	433.14	4296.57	433.13	4302.37	433.15	4314.23	433.16
4323.74	433.02	4348.72	433.08	4362.1	433.07	4367.2	433.04	4387.29	433.05
4401.98	433	4419.63	432.73	4425.52	432.66	4440.73	432.57	4451.02	432.48
4454.94	432.48	4463.61	432.4	4472.07	432.16	4476.21	431.99	4487.09	431.7
4488.99	431.61	4501.72	430.51	4507.38	429.85	4514.45	428.93	4525.04	429.42
4527.19	429.43	4532.74	430.12	4539.95	430.88	4552.51	432.9	4559.81	433.66
4565.13	434.42	4577.47	435.03	4590.71	435.43	4603.49	435.85	4612.78	436.06
4616.28	436.12	4630.44	436.28	4641.53	436.39	4647.56	436.5	4654.13	436.67
4666.86	437.19	4679.63	438.12	4682.87	438.51	4692.41	439.8	4700.53	441.99
4705.2	443.3	4718.19	446.37	4730.44	449.57	4735.31	450.92	4743.06	453.26
4752.96	456.67	4763.12	460.37	4768.55	462.37	4770.62	462.94	4781.34	465.4
4788.27	465.61	4794.12	465.66	4805.93	464.69	4811.01	464.19	4814.68	463.42
4826.65	463.33								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1581	.013	1690.08	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1581	1690.08	700	502	530	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1270	436.7	2173	4826.65	435

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 1098

INPUT
Description:
Station Elevation Data num= 446

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	436.02	13.11	433.96	29.61	430.92	46.11	428.9	62.69	428.9
79.12	429.17	95.12	429.51	128.13	429.27	146.54	429.46	177.14	429.87
179.77	429.88	193.65	430.01	196.64	430.11	210.15	430.39	213.52	430.39
226.66	430.48	243.16	430.7	247.13	430.73	259.16	430.9	263.62	431.11
275.67	431.57	280.49	431.99	292.17	432.68	297.36	432.78	308.68	433.2
314.23	433.23	325.18	433.19	330.92	433.12	347.47	433.16	357.69	433.11
374.19	433.18	381.21	433.25	390.69	433.23	398.08	433.24	407.2	433.39
423.2	433.31	431.31	433.35	439.71	433.45	456.21	433.7	472.71	433.77
481.93	433.97	489.22	434.09	498.5	434.29	505.22	434.35	515.16	434.3
521.73	434.33	532.03	434.2	548.91	434.13	554.73	434.13	565.78	434.28
571.24	434.32	582.3	434.36	587.24	434.4	599.01	434.37	603.75	434.34
615.88	434.22	632.75	434.07	653.26	434.04	669.26	433.94	685.76	433.72
716.6	433.58	733.47	433.55	751.28	433.49	766.7	433.59	784.29	433.63
800.45	433.42	817.3	433.32	833.68	433.32	867.42	432.87	882.81	432.8
884.3	432.9	901.11	433.83	915.32	434.78	917.53	434.82	931.82	435.18
951.27	435.27	964.83	435.31	968.14	435.35	981.34	435.39	997.34	435.7
1001.37	435.76	1013.84	435.88	1018.25	435.87	1030.35	435.94	1046.85	436.18
1063.35	436.39	1079.36	436.43	1085.22	436.36	1102.09	436.36	1118.96	436.47
1128.87	436.55	1135.84	436.68	1145.37	436.81	1152.48	436.95	1185.94	437.52
1210.89	437.71	1219.68	437.56	1227.39	437.49	1236.27	437.19	1243.4	437.03
1252.92	436.97	1259.9	436.86	1269.79	436.76	1276.41	436.63	1286.66	436.34
1292.91	436.19	1303.53	435.99	1309.41	435.93	1320.06	435.77	1336.76	435.57
1341.92	435.49	1353.64	435.45	1370.51	435.45	1374.93	435.48	1387.38	435.19
1391.43	435.08	1403.85	434.94	1407.44	434.92	1420.61	434.1	1423.94	433.95
1440.44	432.74	1454.36	432.85	1456.95	432.83	1471.23	431.98	1487.65	431.78
1489.46	431.72	1504.46	430.99	1505.96	430.95	1516	430.07	1545	427.65
1551	425.31	1555.09	424.39	1557.87	423.46	1563	421.75	1613	421.75
1637.12	429.79	1637.47	429.77	1653.54	430.68	1667.47	430.55	1670.27	430.55
1681.8	430.31	1686.99	430.16	1696.14	430.35	1703.72	430.34	1710.47	430.19
1724.69	430.19	1736.67	430.22	1738.71	430.3	1753.04	430.26	1767.38	430.71
1770.13	430.73	1781.72	430.6	1786.86	430.68	1796.05	430.7	1803.58	430.76
1810.21	431.1	1819.92	431.34	1823.68	431.34	1837.05	431.05	1850.44	431.19
1863.79	431.2	1877.15	431.3	1888.43	431.28	1905.03	431.1	1922.16	431.15
1930.27	431.26	1943.67	431.36	1959.41	431.53	1970.43	431.68	1983.54	431.64
1990.15	431.66	1996.73	431.58	2007.27	431.77	2020.04	431.83	2023.45	431.82
2036.85	431.68	2041.53	431.65	2050.25	431.38	2058.65	431.45	2063.53	431.56
2076.64	431.51	2090.04	431.62	2103.44	431.34	2116.84	431.4	2130.24	431.39
2143.77	431.57	2156.68	431.67	2160.38	431.59	2177.5	431.61	2183.29	431.56
2196.65	431.55	2211.75	431.67	2223.42	431.59	2228.88	431.62	2236.63	431.59
2249.82	431.71	2262.62	431.7	2276.58	431.55	2279.74	431.54	2289.93	431.58
2296.87	431.57	2303.29	431.6	2316.58	431.53	2330.6	431.84	2347.73	431.84
2356.4	431.59	2364.86	431.37	2369.8	431.34	2381.98	431.32	2383.2	431.35
2396.6	431.36	2399.11	431.39	2409.74	431.84	2415.72	432.12	2422.99	432.28
2432.84	432.47	2436.39	432.41	2449.97	431.99	2463.14	431.89	2474.17	431.64
2484.22	431.12	2500.83	431.68	2502.8	431.73	2509.76	431.68	2516.17	431.68
2517.96	431.73	2537.04	432.64	2552.21	432.47	2556.37	432.37	2569.34	432.51
2582.8	432.45	2596.08	432.19	2603.07	432.36	2609.43	432.37	2620.2	432.52
2626.41	432.48	2631.96	432.48	2671.75	432.06	2688.18	432.17	2716.14	432.17
2722.44	432.15	2742.86	432.04	2773.3	432.05	2782.64	431.96	2796	432.15
2807.55	432.03	2809.35	432.05	2824.68	432.04	2835.85	432.14	2841.28	432.14
2849.12	432.24	2858.41	432.48	2875.54	432.56	2889.28	432.34	2892.66	432.36
2902.63	432.35	2909.79	432.37	2915.84	432.46	2926.4	432.49	2928.94	432.45
2943.53	432.46	2955.7	432.53	2960.65	432.62	2978.58	433.01	2981.26	433.05
2993.57	433.01	2997	433.15	3005.7	433.19	3014.86	432.84	3023.77	433.04
3030.09	433.23	3033.28	433.16	3051.71	433.2	3070.13	433.09	3088.55	433.21
3103.46	433.2	3106.41	433.18	3115.64	433.01	3124.84	433.06	3133.95	433.03
3143.26	432.96	3152.48	432.97	3164.79	432.88	3177.1	433	3180.1	432.96
3189.22	432.91	3197.97	432.92	3201.34	432.9	3213.63	432.99	3216.39	432.96
3234.81	432.94	3253.23	433.08	3262.71	433.01	3281.78	433.02	3289.52	432.97
3299.17	432.98	3307.94	433.17	3311.42	433.18	3323.7	433.07	3336.01	433.2
3344.79	432.89	3348.31	432.93	3355.42	432.95	3360.62	433.14	3381.07	433.13
3406.76	434.32	3421.65	434.77	3429.06	434.64	3433.92	434.47	3436.34	434.51
3446.23	434.52	3466.16	434.5	3472.62	434.51	3479.1	434.48	3509.47	433.5
3512.84	433.6	3521.53	433.62	3552.34	434.24	3568.08	433.64	3583.51	432.62
3593.48	431.83	3600.27	431.27	3621.92	433.32	3667.67	433.86	3674.15	433.97
3727.67	433.34	3763.5	434.26	3765.7	434.03	3767.18	433.99	3770.21	433.6
3784.13	432.78	3788.71	432.46	3797.81	432.39	3802.55	432.6	3813.29	433.16
3820.97	433.16	3825.5	433.33	3837.55	433.72	3849.77	433.84	3862.02	433.67
3874.28	434	3886.59	434.77	3894.1	435.12	3898.9	435.01	3908.55	435.16
3911.21	435.13	3923.29	434.73	3926.13	434.58	3937.67	434.28	3996.78	434.12
3999.7	434.04	4004.08	434.58	4009.02	434.51	4021.94	434.23	4033.3	434.24
4040.36	433.67	4043.46	433.33	4058.79	431.1	4063.66	430.86	4108.11	444.04

4117.99	444.52	4141.37	443.33	4149.18	442.86	4160.46	441.07	4205.05	440.12
4211.61	440.48	4223.47	441.84	4234.22	444.43	4265.24	442.08	4314.69	434.98
4323.89	434.74	4327.06	434.77	4333.44	434.76	4350.95	434.62	4363.87	434.65
4376.06	434.6	4388.05	434.74	4406.58	434.86	4425	434.86	4443.42	434.57
4449.48	434.52	4461.69	434.46	4473.85	434.42	4479.71	434.43	4486.04	434.4
4510.6	434.15	4516.55	434.12	4522.84	434.14	4535.32	434.12	4553.39	434.27
4571.26	434.29	4583.9	434.23	4596.14	434.25	4620.7	434.22	4633.01	434.12
4662.81	433.72	4681.23	433.38	4699.65	432.88	4719.7	432.22	4730.93	431.82
4736.5	431.71	4743.1	431.4	4755.17	430.97	4767.43	430.31	4779.67	430.09
4791.21	428.76	4804.22	427.73	4809.63	427.72	4816.53	428.05	4828.05	429
4828.83	429.04	4845.92	431.31	4853.09	432.2	4864.34	433.52	4865.4	433.7
4867.54	433.86	4877.66	434.77	4882.76	435.17	4901.18	436.18	4919.6	437.8
4926.62	437.97	4937.47	438.14	4950.96	438.58	4955.89	438.68	4963.21	439.45
4974.31	442.05	4977.72	442.56	4987.75	444.13	4992.74	444.87	5000.06	446.21
5011.16	448.64	5012.35	449.01	5014.82	450.05	5024.4	453.93	5029.02	456.2
5036.62	458.98	5047.44	462.02	5048.93	462.46	5051.92	463.17	5061.19	465.58
5073.44	465.15	5084.29	463.43	5088.85	462.62	5090.54	462.65	5091.15	462.52
5099.68	462.51								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1545	.013	1637.12	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1545	1637.12	510	360	381	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	1186	437.5	2020	5099.68	432

CROSS SECTION

RIVER: Thompsons
REACH: Thompsons RS: 738

INPUT
Description:
Station Elevation Data num= 448

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	434.97	8.43	433.71	24.06	429.99	25.28	429.72	29.91	429.31
42.12	428.3	45.28	428.45	58.97	428.95	66.47	429.3	75.81	429.79
87.22	429.51	108.99	429.11	125.83	429.53	142.68	430.06	159.52	430.34
171.58	430.86	175.86	430.99	192.7	431.16	213.89	431.3	226.39	431.23
235.09	431.32	243.23	431.35	255.79	431.49	274.74	431.45	276.84	431.43
293.26	431.59	298.04	431.67	310.1	431.65	319.24	431.78	339.92	431.83
343.28	431.88	356.77	431.95	361.01	431.95	376.97	432.54	382.29	432.51
393.81	432.95	403.57	433.02	410.66	432.44	424.31	432.97	426.99	432.95
437.55	432.99	445.46	432.92	460.68	432.56	466.66	432.46	487.85	432.04
494.37	432	510.7	432.01	519.57	432.15	526.17	432.29	540.11	432.48
544.39	432.48	561.23	432.34	567.98	432.22	581.82	432.13	611.26	431.71
628.1	431.5	635.27	431.43	656.47	431.3	661.79	431.29	678.12	431.15
682.38	431.14	711.81	431.22	719.42	431.22	740.62	431.37	745.5	431.42
760.66	431.67	767.94	431.89	778.46	432.25	795.15	433.12	811.85	433.52
820.07	433.57	828.55	433.67	839.49	433.53	844.74	433.42	859.12	433.64
861.44	433.65	873.8	434.1	878.93	434.26	894.83	434.68	911.53	434.79
927.72	434.99	937.64	435.05	944.42	435.14	957.41	435.14	977.82	435.44
994.52	435.33	1010.71	435.5	1016.22	435.54	1027.41	435.73	1044.1	435.89
1055.87	435.95	1077.5	436.01	1094.89	436.23	1127.09	436.57	1134.43	436.72
1143.78	436.86	1160.48	437.2	1176.67	437.36	1193.14	437.27	1210.07	437.29
1212.91	437.26	1226.77	437.22	1232.68	437.11	1243.47	436.85	1252.12	436.57
1259.66	436.36	1271.61	436.22	1276.36	436.1	1293.05	435.81	1309.75	435.76
1326.45	435.35	1342.64	435.26	1359.34	435.14	1376.04	435.06	1392.74	434.95
1409.43	434.73	1428.87	433.33	1442.3	431.88	1447.7	430.89	1458.83	429.19
1517.84	426.42	1540.72	425.34	1554	421.03	1584	421.03	1604	421.03
1642.79	427.29	1656.29	429.6	1659.55	429.83	1672.33	431.04	1676.89	431.05
1688.87	431.14	1705.41	430.51	1714.76	430.94	1729.98	431.3	1744.14	431.39
1754.87	431.37	1771.65	431.14	1786.3	431.08	1788.43	431.04	1800.47	431.02
1805.2	431.07	1814.64	431.09	1821.98	430.98	1828.63	430.84	1838.25	430.89
1842.55	430.84	1855.03	430.89	1885.01	430.94	1888.58	430.91	1899.15	430.98
1905.36	431.33	1913.08	431.6	1921.63	431.55	1938.4	431.9	1955.74	431.92
1969.44	432.05	1983.61	432.07	1988.73	432.11	2005	432.11	2011.52	432.16
2025.69	432.2	2038.55	432.28	2054.03	432.27	2072.11	432.35	2082.1	432.34
2105.15	432.18	2155.48	431.86	2166.6	431.91	2171.75	431.88	2180.6	431.93
2188.53	432.02	2208.87	431.96	2237.17	431.97	2238.86	431.96	2255.13	432.12
2265.08	432.24	2271.91	432.36	2279.25	432.37	2288.68	432.23	2293.42	432.3
2305.46	432.04	2319.15	435.05	2322.24	435.76	2335.54	433.57	2338.51	433.23
2349.6	432.51	2355.28	431.84	2363.73	431.69	2372.06	431.35	2377.87	431.27
2388.84	431.33	2406.13	431.21	2432.38	430.9	2438.66	430.71	2448.21	430.55
2455.44	430.33	2472.21	430.24	2476.55	430.36	2488.99	431.07	2490.68	431.06
2500.16	431.24	2505.26	431.3	2518.64	431.17	2522.03	431.25	2532.81	431.19
2538.81	431.19	2546.98	431.62	2555.59	432.69	2561.15	432.75	2572.37	433.24

2575.24	433.28	2588.63	432.09	2589.37	432.09	2611.84	431.11	2622.19	431.12
2627.19	431.03	2643.23	431.17	2672.01	431.98	2681.17	431.8	2701.77	431.3
2715.94	431.17	2722.34	431.18	2730.11	431.53	2739.12	431.66	2744.15	431.67
2755.39	432.09	2772.37	432.15	2786.33	431.93	2800.47	432.08	2805.72	432.04
2814.6	432.04	2822.49	431.93	2828.58	431.8	2854.01	431.85	2856.58	431.9
2862.19	431.74	2872.32	431.58	2884.91	431.85	2889.09	431.86	2905.87	431.77
2913.06	431.98	2922.14	432.1	2926.99	432.1	2941.16	432.23	2972.47	432.37
2989.25	432.6	3005.51	432.88	3022.29	433.06	3025.75	433.12	3039.07	433.2
3054.07	433.13	3072.62	433.16	3082.09	433.78	3088.89	433.84	3096.05	433.85
3105.67	433.82	3122.44	433.88	3134.4	433.5	3139.22	433.41	3152.19	433.84
3164.06	433.69	3176.18	433.7	3187.8	433.67	3194.94	433.59	3214.22	433.53
3223.73	433.55	3235.74	433.69	3252.8	433.55	3259.64	433.56	3295.31	433.24
3302.68	433.07	3310.07	432.96	3319.3	432.9	3331.32	432.88	3359.9	433.28
3372.48	435.42	3388.52	434.11	3397.79	433.5	3405.92	433.6	3414.87	433.6
3425.21	433.76	3426.89	434.11	3429.66	434.24	3438.85	435.24	3444.5	434.91
3450.68	435.28	3453.56	435.01	3462.66	436.45	3518.84	441.14	3521.06	441.05
3524.29	441.31	3540.35	441.31	3556.15	440.27	3569.97	440	3578.34	438.96
3581.99	438.58	3593.97	437.19	3597.63	437.48	3605.91	437.71	3616.91	434.56
3619.4	434.38	3636.2	433.48	3641.77	432.63	3654.9	431.34	3674.19	429.5
3682.65	430.61	3689.39	432.37	3693.48	432.27	3710.08	432.31	3716.71	432.42
3754.75	433.3	3770.04	433.79	3777.76	433.97	3789.33	434.1	3796.98	434.04
3808.61	434.28	3809.63	434.26	3827.9	433.17	3832.8	433.06	3846.6	433.57
3856.51	433.64	3865.89	433.79	3872.87	433.87	3885.18	433.96	3892.55	433.97
3904.46	433.91	3916.51	434.62	3923.75	434.77	3928.37	435.08	3936.12	435.01
3942.45	435.17	3952.08	436.58	3961.74	436.12	3967.99	435.69	3976.06	435.54
3981.03	436.03	3988.01	436.58	3999.37	434.71	4000.31	434.65	4016.19	434.94
4023.1	434.61	4050.23	434.58	4071.21	435.07	4076.88	434.99	4094.48	434.86
4096.16	434.88	4107.54	434.82	4115.45	434.89	4133.92	434.85	4169.91	434.84
4190.86	434.73	4211.3	434.73	4239.23	434.37	4245.79	434.77	4268.72	434.78
4277.31	434.85	4301.26	436.37	4355.41	436.19	4364.43	435.78	4379.82	435.55
4382.25	435.48	4393.01	433.84	4438.54	432.18	4457.01	431.12	4479.56	430.4
4489.65	430.4	4498.85	430.96	4501.61	431.16	4506.32	431.35	4517.55	431.92
4525.33	432.14	4536.84	432.32	4544.49	432.86	4556.13	433.91	4563.77	434.07
4575.42	433.95	4632.59	435.54	4644.75	435.37	4651.98	435.32	4668.78	435.31
4680.8	435.19	4692.77	435.12	4704.51	434.96	4728.54	434.79	4747.83	434.5
4764.33	434.19	4776.28	434.07	4786.41	434.11	4799.96	433.83	4805.11	433.63
4811.87	433.16	4824.4	432.49	4835.9	431.96	4843.68	431.55	4847.91	431.16
4854.91	430.72	4859.9	430.33	4862.97	430.23	4871.85	429.17	4882.26	426.43
4883.76	426.12	4886.29	425.9	4895.53	425.39	4900.96	424.97	4907.44	425.42
4918.15	427.21	4920.25	427.59	4931.39	428.87	4939.53	429.06	4948.91	430.4
4953.08	430.93	4981.4	432.83	5001.46	432.95	5013.27	433.07	5026.27	433.16
5044.65	434.24	5051	434.38	5073.96	435.77	5076.52	435.88	5092.66	435.97
5098.46	435.95	5107.9	436.01	5122.43	435.99	5134.45	435.91	5146.46	435.96
5158.48	435.93	5169.81	435.83	5182.21	435.53	5194.03	435.29	5207.8	435.26
5218.01	435.18	5227.08	435.14	5234.88	436.92	5256.6	442.18	5266.26	445.64
5280.4	449.23	5298.12	456.07	5304.31	457.87	5322.93	465.09	5325.59	465.39
5329.99	465.51	5337.56	465.54	5342.22	465.18	5349.51	465.14	5361.51	464.82
5373.24	463.05	5374.19	462.79	5388.84	462.77				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1458.83	.04	1672.33	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1458.83	1672.33	0	0	0	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	1160	438	F
1730	5500	438	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
2323	5388.84	435.8

SUMMARY OF MANNING'S N VALUES

River:Thompsons

Reach	River Sta.	n1	n2	n3
Thompsons	4901	.1	.013	.1
Thompsons	4602	.1	.013	.1
Thompsons	4104	.1	.013	.1
Thompsons	3597	.1	.013	.1
Thompsons	3098	.1	.013	.1
Thompsons	2597	.1	.013	.1
Thompsons	2097	.1	.013	.1
Thompsons	1600	.1	.013	.1
Thompsons	1098	.1	.013	.06
Thompsons	738	.1	.04	.06

SUMMARY OF REACH LENGTHS

River: Thompsons

Reach	River Sta.	Left	Channel	Right
Thompsons	4901	300	299	290
Thompsons	4602	517	498	440
Thompsons	4104	650	507	490
Thompsons	3597	510	499	584
Thompsons	3098	690	501	980
Thompsons	2597	760	500	410
Thompsons	2097	460	497	900
Thompsons	1600	700	502	530
Thompsons	1098	510	360	381
Thompsons	738	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Thompsons

Reach	River Sta.	Contr.	Expan.
Thompsons	4901	.1	.3
Thompsons	4602	.1	.3
Thompsons	4104	.1	.3
Thompsons	3597	.1	.3
Thompsons	3098	.1	.3
Thompsons	2597	.1	.3
Thompsons	2097	.1	.3
Thompsons	1600	.1	.3
Thompsons	1098	.1	.3
Thompsons	738	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Thompsons	4901	100 year	2740.00	430.75	434.89	434.89	436.64	0.001688	10.60	258.43	74.84	1.01
Thompsons	4901	25 year	2170.00	430.75	434.34	434.34	435.88	0.001751	9.95	218.12	71.53	1.00
Thompsons	4901	10 year	1820.00	430.75	433.97	433.97	435.36	0.001804	9.48	191.99	69.31	1.00
Thompsons	4901	5 year	1510.00	430.75	433.61	433.61	434.87	0.001865	9.00	167.75	67.18	1.00
Thompsons	4901	2 year	1050.00	430.75	433.03	433.03	434.05	0.001991	8.12	129.32	63.65	1.00
Thompsons	4602	100 year	2680.00	430.00	434.09	434.09	435.81	0.001688	10.53	254.84	79.62	1.00
Thompsons	4602	25 year	2190.00	430.00	433.61	433.61	435.15	0.001756	9.99	219.24	71.62	1.01
Thompsons	4602	10 year	1850.00	430.00	433.25	433.25	434.66	0.001807	9.54	193.97	69.47	1.01
Thompsons	4602	5 year	1530.00	430.00	432.88	432.88	434.15	0.001868	9.05	169.12	67.29	1.01
Thompsons	4602	2 year	1060.00	430.00	432.29	432.29	433.32	0.001995	8.15	130.05	63.71	1.01
Thompsons	4104	100 year	2680.00	428.75	432.85	432.69	434.37	0.001456	9.89	279.56	103.31	0.94
Thompsons	4104	25 year	2190.00	428.75	432.24	432.24	433.73	0.001773	9.77	224.64	80.71	1.01
Thompsons	4104	10 year	1850.00	428.75	431.92	431.92	433.26	0.001827	9.28	199.33	75.23	1.00
Thompsons	4104	5 year	1530.00	428.75	431.57	431.57	432.78	0.001891	8.82	173.51	72.62	1.01
Thompsons	4104	2 year	1060.00	428.75	431.00	431.00	431.98	0.002021	7.96	133.10	68.33	1.01

Thompsons	3597	100 year	2870.00	427.50	431.77	431.77	433.55	0.001655	10.69	268.50	75.64	1.00
Thompsons	3597	25 year	2290.00	427.50	431.22	431.22	432.79	0.001715	10.06	227.71	72.34	1.00
Thompsons	3597	10 year	1910.00	427.50	430.83	430.83	432.25	0.001766	9.57	199.67	69.97	1.00
Thompsons	3597	5 year	1580.00	427.50	430.45	430.45	431.74	0.001850	9.12	173.31	67.67	1.00
Thompsons	3597	2 year	1100.00	427.50	429.84	429.84	430.90	0.001974	8.23	133.70	64.07	1.00
Thompsons	3098	100 year	2870.00	426.24	430.51	430.51	432.30	0.001675	10.73	267.38	75.56	1.01
Thompsons	3098	25 year	2290.00	426.24	429.96	429.96	431.55	0.001739	10.10	226.66	72.26	1.01
Thompsons	3098	10 year	1910.00	426.24	429.57	429.57	431.00	0.001793	9.61	198.68	69.90	1.00
Thompsons	3098	5 year	1580.00	426.24	429.20	429.20	430.49	0.001846	9.11	173.42	67.69	1.00
Thompsons	3098	2 year	1100.00	426.24	428.59	428.59	429.65	0.001981	8.24	133.54	64.06	1.01
Thompsons	2597	100 year	3060.00	425.00	429.43	429.43	431.28	0.001657	10.92	280.34	76.57	1.01
Thompsons	2597	25 year	2400.00	425.00	428.82	428.82	430.44	0.001726	10.23	234.51	72.89	1.01
Thompsons	2597	10 year	1980.00	425.00	428.39	428.39	429.85	0.001785	9.71	203.82	70.32	1.01
Thompsons	2597	5 year	1630.00	425.00	428.00	428.00	429.32	0.001846	9.21	177.05	68.00	1.01
Thompsons	2597	2 year	1110.00	425.00	427.35	427.35	428.41	0.001982	8.26	134.31	64.12	1.01
Thompsons	2097	100 year	3060.00	423.75	428.48	428.18	430.06	0.001316	10.09	303.27	78.35	0.90
Thompsons	2097	25 year	2400.00	423.75	427.57	427.57	429.19	0.001726	10.23	234.55	72.90	1.01
Thompsons	2097	10 year	1980.00	423.75	427.14	427.14	428.60	0.001783	9.71	203.90	70.33	1.01
Thompsons	2097	5 year	1630.00	423.75	426.76	426.75	428.07	0.001824	9.17	177.76	68.07	1.00
Thompsons	2097	2 year	1110.00	423.75	426.12	426.11	427.16	0.001943	8.21	135.18	64.20	1.00
Thompsons	1600	100 year	3300.00	422.75	427.38	427.38	429.30	0.001638	11.11	296.90	78.26	1.01
Thompsons	1600	25 year	2510.00	422.75	426.68	426.68	428.33	0.001692	10.29	243.84	74.01	1.00
Thompsons	1600	10 year	2060.00	422.75	426.24	426.24	427.71	0.001743	9.75	211.32	71.27	1.00
Thompsons	1600	5 year	1690.00	422.75	425.83	425.83	427.15	0.001807	9.24	182.93	68.80	1.00
Thompsons	1600	2 year	1120.00	422.75	425.12	425.12	426.18	0.001979	8.27	135.36	64.44	1.01
Thompsons	1098	100 year	3300.00	421.75	426.92		428.38	0.001095	9.68	340.95	81.65	0.83
Thompsons	1098	25 year	2510.00	421.75	426.02	425.68	427.37	0.001267	9.30	269.78	76.64	0.87
Thompsons	1098	10 year	2060.00	421.75	425.55	425.23	426.75	0.001299	8.79	234.42	74.03	0.87
Thompsons	1098	5 year	1690.00	421.75	425.07	424.83	426.19	0.001406	8.46	199.72	70.93	0.89
Thompsons	1098	2 year	1120.00	421.75	424.33	424.12	425.21	0.001473	7.52	148.88	65.46	0.88
Thompsons	738	100 year	3420.00	421.03	427.07	424.45	427.49	0.002501	5.21	656.79	138.12	0.42
Thompsons	738	25 year	2620.00	421.03	426.07	423.91	426.45	0.002498	4.94	529.83	120.24	0.42
Thompsons	738	10 year	2150.00	421.03	425.52	423.57	425.86	0.002501	4.62	465.00	116.96	0.41
Thompsons	738	5 year	1730.00	421.03	424.99	423.24	425.28	0.002502	4.29	403.38	113.76	0.40
Thompsons	738	2 year	1130.00	421.03	424.12	422.70	424.33	0.002504	3.69	306.27	108.51	0.39

APPENDIX D
ELECTRONIC DATA

Existing Hydrologic Model (HEC-HMS)
HEC-RAS Model for Existing Channel and Alternatives
Survey Data

Please refer to Mountain Creek FINAL FPP Appendix M for Thompson's Branch Conceptual Analysis Digital Data

APPENDIX L
COMMENT/RESPONSE

Comments on Mountain Creek Flood Protection Project (TWDB Grant) 12/19/2007

General:

1. Incorporate Final Thompson's Branch report as an Addendum or Appendix to this report, so all information is in one document (for future use and ease of location if need to find). Describe this inclusion in the executive summary as a separate report.
2. Suggestion - Provide a short explanation/summation of the sensitivity analysis performed for this project – e.g. – T_C and T_{LAG} were adjusted/varied and results were reasonable/unreasonable. It is mentioned in Section 2.6.3 but it may need to be emphasized.
3. Note – For a cleaner model, the ineffective flow areas could be less abrupt. However, the model results may not be affected so this is purely an observation.
4. In the Alternatives, please make a qualifying statement that any and all alternatives are subject to approved and available funding.
5. Have an Acknowledgement section with individuals who contributed listed. Also state the Role that Halff has Played as third Party Reviewer.
6. For the report please state the year for the “City of Grand Prairie Drainage Design Manual” used in this report.

Report:

1. Section 1: Provide the documentation as to how the $7,300,000 damages was arrived at for the number of claims listed.

2. Section 1.1
   - a. – Scope of Services – This segment should closely, if not exactly, match the TWDB contract verbiage. If there is a difference, provide the explanation. For example, the contract states that the target area for this project goes to Joe Pool Lake Dam. I believe the explanation is in the second paragraph, but we need to match the contract and *then* provide why we didn’t include that area.
   - B. Please provide Romin with cost information to revise the FEMA floodplain and creek profiles in the last sentence.

3. Section 1.1 – Scope of Services (page 2, paragraph 3) – Please change the following statement to include the bold italicized portions: “This effort also identifies ***possible*** capital improvements ***(dependent upon approved funds)*** that could potentially mitigate the risk, ***or a portion thereof***, and…”.

4. Section 2.0 – Second Paragraph – State the exact Elevations for the 1.5 foot variation in water surface elevation. Third Paragraph – Please revise the sentence concerning the discharge from Joe Pool Lake to reflect the bold italicized verbiage: “The ***mandatory*** discharge…”.

5. Section 2.5.1 – Stream Flow Routing (last paragraph, last sentence) – Please revise verbiage to reflect the source for the contours: “…HEC-RAS models…area streams are based on contours.” Which contours?

6. Section 2.5.2 – Reservoir Routing (first paragraph) – Please revise verbiage to include bold italicized revision: "***Increases on lake elevation have been recorded and documented*** (reference) ***during flooding events since it is not possible to maintain a fully constant lake level.***" The exact verbiage is not necessarily required but increases are not expected, they are documented and recorded. The assumption of a on foot increase is what is expected. Please state the exact elevation for the Constant pool elevation.

7. Section 2.6 - Hydrologic Model Validation – Please include the Exact date of this event throughout the report where mentioned. Suggestion: Include hydrograph in report showing comparison of computed versus observed results at Mountain Creek dam. Therefore, in addition to comparison of peak discharges, a comparison of the shape volume and timing can be shown. Describe in report if the volume or timing have an effect on the validation.

8. Section 2.6 - Hydrologic Model Validation – Typo in third paragraph "Mountain ***Creek*** Lake Dam" – needs capitalization

9. Section 2.6.1 – Comparison to Exelon Log – In Section 2.6 a statement was made that Exelon's log was most likely an "overestimation" of the flows. This section shows the computed discharge to be higher than Exelon's "overestimation". Do we need to adjust this statement so that overestimation = conservative?

10. Section 3.2.2 – Unsteady Analysis – Was the pilot channel subject to sensitivity analysis? For example, was the Manning's number adjusted or the width/depth adjusted? Since the pilot channel is not there, is this justifiable?

11. Section 4.1.1 – Thompson's Branch Area – Please revise the verbiage in the second sentence of the first paragraph to reflect the bold italicized changes: "***Currently***, no channel exists…" It might not be a good idea to draw attention to undocumented fill at this time.

12. Section 4.1.2 – intermediate Roadway Area – In the first sentence; please remove the "through filled areas…" per reason cited in Comment #9 above. Also, delete the last sentence containing the assumption that the excavated material can be filled – if it is indeed illegal fill, it would need to be removed from the area or mitigated further.

13. Section 4.2 – First Paragraph, third Bullet Point – Please specify the Mobile home Park by name (Willow Bend)

14. Section 4.4 – Alternative 4 – Additional Upstream Detention – When listing the three sub-alternatives in the following sections, they are referred to as "4A" "4B", and "4C". Numbering them 1, 2, and 3 in this section seems incongruous. Label these as "4A" "4B", and "4C".

15. Section 4.4.3 – Alternative 4C – In the "Cost" section, revise the approximate cost from "$494,000,000" to "well over $400,000,000". It is not the desire of the City to "nail down" this number so that it can be used later as an expectation.

Figures:

1. For Exhibits 1 through 4 please also show and label major streets in Grand Prairie as well as adjacent cities to be able to better locate areas.

2. Exhibit 5, Appendix A - Cross Section Location Map - If possible, label major contours and include the source of contours and date; suggestion would be to show centerline stationing and flow direction along Mountain and Thompson's branch; show cross-section 7420 (included in models, but not shown on map); suggestion would be to use a typical engineering scale drawing and make this scale consistent with other Exhibits (6, 7, 8)...possibly change this scale to 1"=1200' to match the others or include other, full-size plots in this report. The reason for this suggestion is so when this study is looked at in the future, distances can be measured more easily between the cross-section location map and flood maps (if separate maps) 3. Exhibits 6, 7, 8 - Appendix A - Halff's primary suggestion is to utilize one of these figures or create another that shows the existing 100-year floodplain with the centerline, cross-sections, and base flood elevations shown. A transparent or un-colored floodplain would be beneficial to see the locations of structures and areas inundated by the 100-year floodplain. Currently, someone will have to look at tables, profiles, cross-section maps and floodplain maps to try to determine what the base flood elevation is at a particular location on these three exhibits, and if they are looking for a particular physical location, it would be hard to determine from the current exhibits.

H&H Models

1. Hydraulic models, steady - Naming of models and model descriptions: "Existing Steady" model description states it was used to evaluate the pilot channel. "Existing Steady - Pilot" is existing conditions with the pilot channel. For the RAS user, how would he/she know off-hand which is the existing conditions model for Mountain Creek? "Ultimate Steady" plan does not mention pilot channel at all.

2. Hydraulic models, general - Suggestion - Add comments to cross-sections where survey data was used to modify the channel section.

3. Hydraulic models, unsteady - On Page 19 of report, it states that the pilot channel has no effect on calculated WSEL for 100-year event. Does this pilot channel significantly affect other frequency events? Would this be critical/not critical to results and conclusions of the study?

Alternatives:

1. Page 23, Figure 5 - Suggestion - Label location of Thompson's Branch

2. There are no figures to represent Alternatives 1-4A. Trying to determine physical locations of what is described in the text is difficult. Suggestion would be to include exhibits representing items described in text.

3. Appendix A, Exhibit 10, Alternative 4B - Label Fish Creek and Kirby Creek upstream of the proposed reservoir.

4. Alternative 4B - Describe potential impacts to these two creeks (Fish and Kirby) by construction of the reservoir, which already have significant flooding and erosion issues. Flooding issues are currently caused by backwater along the creeks. What considerations would need to be made if the reservoir was implemented? Possibly just general suggestions in the report.

5. On Page 36, second-to-last paragraph, is it reasonable to state that this alternative is "certainly the most cost effective alternative pending further investigation..."? Since no estimates were prepared and the dam safety and power plant operations impacts are critical items, this solution could potentially not be the most cost effective in the end.

6. Appendix I - Does the cost estimate for Alternative 4A need to be included, since it is blank? Could be confusing to a future reader.

7. Appendix I - Engineering and Surveying (20%) - This is tacked on to all cost estimates, including ones that include buy-out of property. Should the E&S cost also include 20% of buy-out costs? For Alternative 4B and 4C, the E&S is substantial.

8. Appendix I - Two Alternative 6 improvements are labeled with different costs. Should one be Alternative 5?

9. Appendix I - Alternative 5 and 6 - Is $600/SF a reasonable assumption on Unit Price for Bridge Extension/Replacement? Would the Main Street Bridge replacement really cost $42,600,000? Please check quantities and verify unit pricing for all items shown in cost estimates.

10. Appendix I – Please provide an individual map for each Alternative, since it is very hard to follow what improvements are being covered in each.

File:Q:\Projects\Mountain Creek Drainage Study Y#0485\Comments on Mountain Creek Flood Protection Project (3).doc

Espey Consultants, Inc.
Environmental & Engineering Services

March 19, 2008

Joe Sherwin, P.E., CFM
Flood Plain Administrator
City of Grand Prairie
206 W. Church Street
Grand Prairie, TX 75053

Re: Response to Comments on Mountain Creek Flood Protection Plan

Dear Joe:

Below, please find responses to the comments on the Mountain Creek Flood Protection Plan received on December 19, 2007. I have also attached a copy of the revised report and appendices (with the exception of the Thompson's Branch Report and Digital Data Appendix) so that you can review the details of the changes made.

General:
Comment: Incorporate Final Thompson's Branch report as an Addendum or Appendix to this report, so all information is in one document (for future use and ease of location if need to find). Describe this inclusion in the executive summary as a separate report.
Response: Concur. This will be added as an appendix in the final report.

Comment: Suggestion - Provide a short explanation/summation of the sensitivity analysis performed for this project – e.g. – T_C and T_{LAG} were adjusted/varied and results were reasonable/unreasonable. It is mentioned in Section 2.6.3 but it may need to be emphasized.
Response: Concur. The Tc calculation was modified from as recommended by the City of Grand Prairie Drainage Design Manual to a TR55 methodology. The following sentences have been added to Section 2.4.2.1, "A maximum sheet flow length of 300 feet is assumed for undeveloped conditions, and 150 feet is assumed for developed conditions. The City of Grand Prairie Drainage Design Manual (October 2006) allows for a maximum sheet flow length of 50 feet in developed areas. The Tc calculations were initially performed using the more stringent (shorter) maximum length prescribed in the GP Drainage Design Manual, but were lengthened during model validation to conform with TR-55. This is further discussed in Section 2.6."

Comment: Note – For a cleaner model, the ineffective flow areas could be less abrupt. However, the model results may not be affected so this is purely an observation.
Response: Comment noted. No changes have been made to the analysis.

Comment: In the Alternatives, please make a qualifying statement that any and all alternatives are subject to approved and available funding.
Response: Concur. The following sentence has been added to the first paragraph in Section 4.0, "All recommendations presented in this report are subject to approval and available funding."

Comment: Have an Acknowledgement section with individuals who contributed listed. Also state the Role that Halff has played as Third Party Reviewer.
Response: Concur. An Acknowledgement section has been added.

Comment: For the report please state the year for the "City of Grand Prairie Drainage Design Manual" used in this report.
Response: Concur. The manual used was the October 2006 edition. This has been added in the final report. Please note that as per the comment from Halff Associates on the July Draft Report that the precipitation used for this analysis is the correct data, but is not in the current Drainage Manual.

Report:
Comment: 1. Section 1: Provide the documentation as to how the $7,300,000 damages was arrived at for the number of claims listed.
Response: Concur. This data comes from the FEMA "Policy & Claim Statistics for Flood Insurance" data (http://www.fema.gov/business/ nfip/statistics/pcstat.shtm). This has been added in the final report.

Section 1.1
Comment: A. – Scope of Services – This segment should closely, if not exactly, match the TWDB contract verbiage. If there is a difference, provide the explanation. For example, the contract states that the target area for this project goes to Joe Pool Lake Dam. I believe the explanation is in the second paragraph, but we need to match the contract and *then* provide why we didn't include that area.
B. Please provide Romin with cost information to revise the FEMA floodplain and creek profiles in the last sentence.
Response: Concur. The scope of service has been modified to more closely match the contracts verbiage. A detailed scope for the preparation of a LOMR has been submitted to the City.

Comment: 3. Section 1.1 – Scope of Services (page 2, paragraph 3) – Please change the following statement to include the bold italicized portions: "This effort also identifies ***possible*** capital improvements ***(dependent upon approved funds)*** that could potentially mitigate the risk, ***or a portion thereof***, and…".
Response: Concur. This has been added in the final report.

Comment: 4. Section 2.0 – Second Paragraph – State the exact Elevations for the 1.5 foot variation in water surface elevation. Third Paragraph – Please revise the sentence concerning the discharge from Joe Pool Lake to reflect the bold italicized verbiage: "The ***mandatory*** discharge…".
Response: Concur. The lake is operated as a level pool. The 1.5 ft variation mentioned reflects the range at which normal operations may be conducted. The following text has been added to the report: "Exelon operates the lake as a level pool facility (to the extent practicable) at elevation 457.5 ft. There is an approximate 1.5 foot range in water surface elevations where the Exelon facilities can operate; this is between 456.0 and 457.5 ft." In reference to the 4 cfs discharge from Joe Pool Lake, the word "typical" has been replaced with "mandatory".

Comment: 5. Section 2.5.1 – Stream Flow Routing (last paragraph, last sentence) – Please revise verbiage to reflect the source for the contours: "…HEC-RAS models…area streams are based on contours." Which contours?
Response: The contour data was provided by the North Central Texas Council of Governments (NCTCOG). The following information has been added to Section 1.5, "The contour data used for this project was based on ground survey and airborne LIDAR data performed in between November 2000 and January 2001 for the North Central Texas Council of Governments (NCTCOG)."

Comment: 6. Section 2.5.2 – Reservoir Routing (first paragraph) – Please revise verbiage to include bold italicized revision: "***Increases on lake elevation have been recorded and documented*** (reference) ***during flooding events since it is not possible to maintain a fully constant lake level.***" The exact verbiage is not necessarily required but increases are not expected, they are documented and recorded. The assumption of a one foot increase is what is expected. Please state the exact elevation for the Constant pool elevation.
Response: Concur. This has been added to Section 2.5.2.

Comment: 7. Section 2.6 - Hydrologic Model Validation – Please include the Exact date of this event throughout the report where mentioned. Suggestion: Include hydrograph in report showing comparison of computed versus observed results at Mountain Creek dam. Therefore, in addition to comparison of peak discharges, a comparison of the shape volume and timing can be shown. Describe in report if the volume or timing have an effect on the validation.
Response: The March 19, 2006 date is listed at each mention. A timing comparison was performed and presented in Section 2.6.1, but please recognize that the data available is not the time series of flow through the dam, simply the operation log. The number of gates open, time of opening, amount each gate is open and the associated flow rate is included for only the times that the gates were changed. The result is not be a hydrograph with which to compare the modeled verses observed timing, but simply a stair-step graph showing how the dam was operated. In addition, the comparison could only be completed through 10:00 PM on March 19, 2006. That being said, the shaped of the hydrographs are very similar and the computed volume is within 1%.

Comment: 8. Section 2.6 - Hydrologic Model Validation – Typo in third paragraph "Mountain ***Creek*** Lake Dam" – needs capitalization.
Response: Concur. This has been corrected in the final report.

Comment: 9. Section 2.6.1 – Comparison to Exelon Log – In Section 2.6 a statement was made that Exelon's log was most likely an "overestimation" of the flows. This section shows the computed discharge to be higher than Exelon's "overestimation". Do we need to adjust this statement so that overestimation = conservative?
Response: The computed discharge is within 4% of Exelon's reported discharge. The computed discharge is, however, greater than Exelon's reported discharge. The reported discharge assumes no tailwater, and it is likely that there are tailwater impacts on the discharge rate, meaning that the actual discharge is likely less than that reported. The error in Exelon's rating curve was not quantified for this report. The results in this report are not intended to be conservative. We simply calibrate to the best available data but also point out that this data does include some uncertainty. The reference to "overestimation" has been removed.

Comment: 10. Section 3.2.2 – Unsteady Analysis – Was the pilot channel subject to sensitivity analysis? For example, was the Manning's number adjusted or the width/depth adjusted? Since the pilot channel is not there, is this justifiable?
Response: The pilot channel was added to facilitate the running of the unsteady analysis. The pilot channel size and Manning's n value were not part of the sensitivity analysis. The pilot channel does not affect the calculated water surface elevation for any of the events. This can be verified by comparing the results of the "Existing Steady" and "Existing Steady – Pilot" plans. This channel was intended to be sized such that it did not impact results for the peak flows, but to smooth hydraulics for the much lower flow rates experienced at the extreme ends of the hydrographs in the unsteady model. The following sentence is included in Section 3.2.2, "This pilot channel is small enough to have no effect on the calculated water surface elevation for any of the studied events."

Comment: 11. Section 4.1.1 – Thompson's Branch Area – Please revise the verbiage in the second sentence of the first paragraph to reflect the bold italicized changes: "***Currently***, no channel exists…" It might not be a good idea to draw attention to undocumented fill at this time.
Response: Concur. This has been changed in the final report.

Comment: 12. Section 4.1.2 – Intermediate Roadway Area – In the first sentence; please remove the "through filled areas…" per reason cited in Comment #11 above. Also, delete the last sentence containing the assumption that the excavated material can be filled – if it is indeed illegal fill, it would need to be removed from the area or mitigated further.
Response: Concur. These changes have been made in the final report. Please note that a disposal cost for excavated material has not been added to the cost estimate.

Comment: 13. Section 4.2 – First Paragraph, third Bullet Point – Please specify the Mobile home Park by name (Willow Bend)
Response: Concur. This has been added to the final report.

Comment: 14. Section 4.4 – Alternative 4 – Additional Upstream Detention – When listing the three sub-alternatives in the following sections, they are referred to as "4A" "4B", and "4C". Numbering them 1, 2, and 3 in this section seems incongruous. Label these as "4A" "4B", and "4C".
Response: Concur. This has been modified in the final report.

Comment: 15. Section 4.4.3 – Alternative 4C – In the "Cost" section, revise the approximate cost from "$494,000,000" to "well over $400,000,000". It is not the desire of the City to "nail down" this number so that it can be used later as an expectation.
Response: Concur. This has been modified in the final report.

Figures:
Comment: 1. For Exhibits 1 through 4 please also show and label major streets in Grand Prairie as well as adjacent cities to be able to better locate areas.
Response: Concur. This has been modified for the final report.

Comment: 2. Exhibit 5, Appendix A - Cross Section Location Map - If possible, label major contours and include the source of contours and date; suggestion would be to show centerline stationing and flow direction along Mountain and Thompson's branch; show cross-section 7420 (included in models, but not shown on map); suggestion would be to use a typical engineering scale drawing and make this scale consistent with other Exhibits (6, 7, 8)...possibly change this scale to 1"=1200' to match the others or include other, full-size plots in this report. The reason for this suggestion is so when this study is looked at in the future, distances can be measured more easily between the cross-section location map and flood maps (if separate maps)
Response: Concur. Source and date of contours has been added (NCTCOG, 2001). Flow direction has been added. Stationing has not been added to this figure as the stream station can be determined based on the displayed cross-section station. It was determined that adding stations along the streamline would add too much clutter to the exhibit. Cross section 7420 has been added. The scale has been modified as suggested and maintained for Exhibits 5, 6 and 7.

Comment: 3. Exhibits 6, 7, 8 - Appendix A - Halff's primary suggestion is to utilize one of these figures or create another that shows the existing 100-year floodplain with the centerline, cross-sections, and base flood elevations shown. A transparent or un-colored floodplain would be beneficial to see the locations

of structures and areas inundated by the 100-year floodplain. Currently, someone will have to look at tables, profiles, cross-section maps and floodplain maps to try to determine what the base flood elevation is at a particular location on these three exhibits, and if they are looking for a particular physical location, it would be hard to determine from the current exhibits.
Response: The intent of Exhibit 6 was to show the magnitude of the floodplains relative to each other (ie. The 10-year floodplain reaches almost the full extents of the 100-year). An additional exhibit (Exhibit 8) has been created showing the transparent 100-Year floodplain (unsteady), cross-section locations, aerial photo, and a table showing the calculated Mountain Creek water surface elevations for each cross-section. Please note that the shown 100-Year floodplain is for Mountain Creek only. A portion of the downstream section would also be inundated by the West Fork Trinity River 100-Year floodplain.

H&H Models
Comment: 1. Hydraulic models, steady - Naming of models and model descriptions: "Existing Steady" model description states it was used to evaluate the pilot channel. "Existing Steady - Pilot" is existing conditions with the pilot channel. For the RAS user, how would he/she know off-hand which is the existing conditions model for Mountain Creek? "Ultimate Steady" plan does not mention pilot channel at all.
Response: Concur. The pilot channel does not affect the calculated water surface elevation for any of the events. That being said, the steady Ultimate Conditions model (Ultimate Steady) does not include a pilot channel. Only unsteady analyses included the pilot channel (as described in Section 3.2.1), this includes the unsteady ultimate conditions 100-year analysis (1% Balanced ULTIMATE). The unsteady plans named will be modified, where appropriate, to include the word “existing” to clarify this for a RAS user.

Comment: 2. Hydraulic models, general - Suggestion - Add comments to cross-sections where survey data was used to modify the channel section.
Response: The raw geometry obtained from the 2001 NCTCOG topography is included in the HEC-RAS as the plan entitled “GeoRAS Geometry”. This was included so one could see the modifications made to this geometry as a result of survey. Almost every cross-section was modified. No additional comments have been added in the models.

Comment: 3. Hydraulic models, unsteady - On Page 19 of report, it states that the pilot channel has no effect on calculated WSEL for 100-year event. Does this pilot channel significantly affect other frequency events? Would this be critical/not critical to results and conclusions of the study?
Response: The pilot channel does not impact calculated water surface elevations for any of the studied events. The pilot channel was intended to be sized such that it did not impact results for the peak flows, but to smooth hydraulics for the much lower flow rates experienced at the extreme ends of the hydrographs in the unsteady model.

Alternatives:
Comment: 1. Page 23, Figure 5 - Suggestion - Label location of Thompson's Branch
Response: Concur. This has been added in the final report.

Comment: 2. There are no figures to represent Alternatives 1-4A. Trying to determine physical locations of what is described in the text is difficult. Suggestion would be to include exhibits representing items described in text.

Response: Concur. Exhibits 11 through 18 have been added to the final report to show the location of Alternatives 1 though 6. No figure was created for Alternative 4C since the location of multiple upstream basins can not be known at this time.

Comment: 3. Appendix A, Exhibit 10, Alternative 4B - Label Fish Creek and Kirby Creek upstream of the proposed reservoir.
Response: Concur. This exhibit is now Exhibit 15. Fish and Kirby Creeks have been labeled.

Comment: 4. Alternative 4B - Describe potential impacts to these two creeks (Fish and Kirby) by construction of the reservoir, which already have significant flooding and erosion issues. Flooding issues are currently caused by backwater along the creeks. What considerations would need to be made if the reservoir was implemented? Possibly just general suggestions in the report.
Response: Concur. The following text has been added to Section 4.4.2: "Two large creeks, Fish Creek and Kirby Creek, would drain directly to this detention pond. Both creeks have existing flooding issues caused by backwater and some erosion issues. The detention pond described above is not expected to impact these existing problems, with the exception of a minor increase in flooding in the creeks immediately adjacent to the proposed pond. Additional study would be required to determine the specific impacts of Alternative 4B to these creeks."

Comment: 5. On Page 36, second-to-last paragraph, is it reasonable to state that this alternative is "certainly the most cost effective alternative pending further investigation..."? Since no estimates were prepared and the dam safety and power plant operations impacts are critical items, this solution could potentially not be the most cost effective in the end.
Response: Concur. This statement has been removed. The sentence now reads "it should be further investigated to determine viability and extent of associated impacts to dam safety and power plant operations."

Comment: 6. Appendix I - Does the cost estimate for Alternative 4A need to be included, since it is blank? Could be confusing to a future reader.
Response: The cost estimate for Alternative 4A has not been removed from the Appendix. It was felt that leaving this blank sheet in place makes it clear that the cost has not been determined, rather than a cost sheet simply is missing. The following note has been added to clarify this: "Alternative 4A requires no construction cost but easement cost and extent of associated impacts to dam safety and power plant operations have not been determined. Further investigation is required."

Comment: 7. Appendix I - Engineering and Surveying (20%) - This is tacked on to all cost estimates, including ones that include buy-out of property. Should the E&S cost also include 20% of buy-out costs? For Alternative 4B and 4C, the E&S is substantial.
Response: Concur. The 20% E&S has been removed from components such as buyout that do not require E&S for Alternatives 2, 4B and 4C. E&S is included for right-of-way/easement acquisition on all other alternatives.

Comment: 8. Appendix I - Two Alternative 6 improvements are labeled with different costs. Should one be Alternative 5?
Response: Alternative 5 is a combination of Alternatives 1, 2, 3, and 4A. The two Alternative 6 costs are for bridge extension verses bridge replacement. This will be further clarified in the report.

Comment: 9. Appendix I - Alternative 5 and 6 - Is $600/SF a reasonable assumption on Unit Price for Bridge Extension/Replacement? Would the Main Street Bridge replacement really cost $42,600,000? Please check quantities and verify unit pricing for all items shown in cost estimates.
Response: Concur. The Alternative 6 costs have been updated using TXDOT unit prices.

Comment: 10. Appendix I – Please provide an individual map for each Alternative, since it is very hard to follow what improvements are being covered in each.
Response: The alternative exhibits have been included in Appendix A in response to an above comment. It was felt that there would be little benefit of including these same exhibits in Appendix I.

Thank you very much for these constructive comments. Please review the above responses and the associated changes in the report and appendices and let us know if you would like any additional changes. I hope these have been resolved to your satisfaction. It is anticipated that additional comments will be generated in the ongoing Texas Water Development Board review. The report will be marked "Final" once all comments have been incorporated.

Thank you again.

Sincerely,

Josha Crowley, P.E., D.WRE
Project Engineer

Attachment

Cc: Romin A. Khavari, P.E., CFM, City Engineer, City of Grand Prairie
Stephen Crawford, P.E., CFM, Halff Associates, Inc.
Wayne K. Hunter, P.E., Espey Consultants, Inc.
Tom Mountz, P.E., CFM, Espey Consultants, Inc.

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TEXAS WATER DEVELOPMENT BOARD

January 6, 2009

Mr. Tom Cox
Deputy City Manager
City of Grand Prairie
317 College
Grand Prairie, Texas 75053-4045

Re: Flood Protection Planning Grant Contract between the Texas Water Development Board (TWDB) and the City of Grand Prairie (CITY), TWDB Contract No. 0604830597, Draft Final Report Comments

Dear Mr. Cox:

Staff members of the TWDB have completed a review of the draft report prepared under the above-referenced contract. ATTACHMENT I provides the comments resulting from this review. As stated in the TWDB contract, the CITY will consider incorporating draft report comments from the EXECUTIVE ADMINISTRATOR as well as other reviewers into the final report. In addition, the CITY will include a copy of the EXECUTIVE ADMINISTRATOR's draft report comments in the Final Report.

The TWDB looks forward to receiving one (1) electronic copy of the entire Final Report in Portable Document Format (PDF) and six (6) bound double-sided copies. The CITY shall also submit one (1) electronic copy of any computer programs or models, and, if applicable, an operations manual developed under the terms of this Contract.

If you have any questions concerning the contract, please contact Gilbert Ward, the TWDB's designated Contract Manager for this project at (512) 463-6418.

Sincerely,

Carolyn L. Brittin
Deputy Executive Administrator
Water Resources Planning and Information

Enclosures

c: Gilbert Ward, TWDB

Attachment I

Draft Final Report Review
TWDB Contract No. 0604830597
Mountain Creek Flood Protection Plan

1. Several alternatives proposed by the study likely could require a water rights permit through the State of Texas pursuant to Texas Water Code §11.121. Please include a discussion of the process in Section 5.3 regarding the permits that would be required through Texas Commission on Environmental Quality.

2. The study follows standard methodologies and practice utilizing acceptable HEC modeling in the engineering aspects of hydrologic and hydraulic techniques. The hydrologic modeling parameters were determined based on the calculation and engineering judgments for the existing and ultimate conditions. Mitigation alternatives identified by the study are eligible for funding under the Board's financial assistance programs. Application requirements and eligibility criteria is identified by Board rules specified in Chapter 363 of the Texas Administrative Code. The report would be appropriate for use in support of an application to the Board for financing the proposed improvements. All additional information required by Board rules, 31 TAC 363.401-404, as well as necessary information to make legal findings as required by Texas Water Code Chapter 17.771-776, would be required at the time of loan application.

Espey Consultants, Inc.
Environmental & Engineering Services

January 16, 2009

Mr. Gilbert Ward
Texas Water Development Board
1700 N. Congress Avenue
Austin, TX 78711

Re: Final Report, TWDB Contract No. 0604830597, Mountain Creek FPP

Dear Mr. Ward:

On behalf of the City of Grand Prairie, Espey Consultants is pleased to provide the six (6) requested copies of the Final Report entitled "Mountain Creek Flood Protection Plan". An electronic copy of the entire report can be found in Appendix M: Digital Data.

The comments provided in Attachment I to the January 6, 2009 letter from Carolyn Brittin have been incorporated into the final report. The following summary describes the responses to these comments for your convenience.

Comment: Several alternatives proposed by the study likely could require a water rights permit through the State of Texas pursuant to Texas Water Code §11.121. Please include a discussion of the process in Section 5.3 regarding the permits that would be required through Texas Commission on Environmental Quality.
Response: The following paragraph has been added to the TCEQ discussion within Section 5.3: "Texas Water Code Section 11.121 Water Right Permit - Use of surface water, including the diversion or storage of water, in the State of Texas requires a water right permit through the State of Texas pursuant to Texas Water Code Section 11.121. TCEQ requires the submission of the Water Rights Permit Package Application, TCEQ-10214 form. This application must be notarized and submitted with the water use permit application fees. Supplemental information may be required with the application."

Comment: The study follows standard methodologies and practice utilizing acceptable HEC modeling in the engineering aspects of hydrologic and hydraulic techniques. The hydrologic modeling parameters were determined based on the calculation and engineering judgments for the existing and ultimate conditions. Mitigation alternatives identified by the study are eligible for funding under the Board's financial assistance programs. Application requirements and eligibility criteria is identified by Board Rules specified in Chapter 363 of the Texas Administrative Code. The report would be appropriate for use in support of an application to the Board for financing the proposed improvements. All additional information required by Board rules, 31 TAC 363.401-404, as well as necessary information to make legal findings as required by Texas Water code Chapter 17.771-776, would be required at the time of loan application.
Response: Comment noted with appreciation.

3809 S. 2nd Street, Suite B-300
Austin, Texas 78704
T 512-326-5659 F 512-326-5723

2777 N. Stemmons Frwy., Suite 1102
Dallas, Texas 75207
T 214-951-0807 F 214-951-0906

450 Gears Road, Suite 205
Houston, Texas 77067
T 281-872-4500 F 281-872-4505

Additional comments were received from the City of Grand Prairie pertaining to the draft report. These comments have been addressed and incorporated into the final report. An appendix has been added to the report showing all comments and associated responses.

Attached, please find six copies of the final report. Each copy of the report includes a CD of digital data as Appendix M. This CD includes an electronic copy of the entire final report in pdf format, electronic copies of the computer models, and other digital data pertinent to the analysis.

Thank you for the opportunity to perform this Flood Protection Plan. Please do not hesitate to contact me at (512) 326-5659 if you have any questions or concerns regarding this submittal.

Sincerely,

Thomas W. Mountz

Thomas W. Mountz, PE, D.WRE, CFM
Project Manager

Attachment

1. Six (6) copies of the Final Mountain Creek FPP Report

Cc: Romin A. Khavari, P.E., CFM, City Engineer, City of Grand Prairie
Stephen Crawford, P.E., CFM, Halff Associates, Inc.
Wayne K. Hunter, P.E., Espey Consultants, Inc.
Josha Crowley, PE, D.WRE, CFM, CPESC, Espey Consultants, Inc.

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APPENDIX M
DIGITAL DATA

PDF of full Final Report
Spatial Data
GIS Precipitation Data
Mountain Creek HEC-HMS Model
Lower Mountain Creek HEC-RAS Model
Thompson's Branch Conceptual Analysis Digital Data